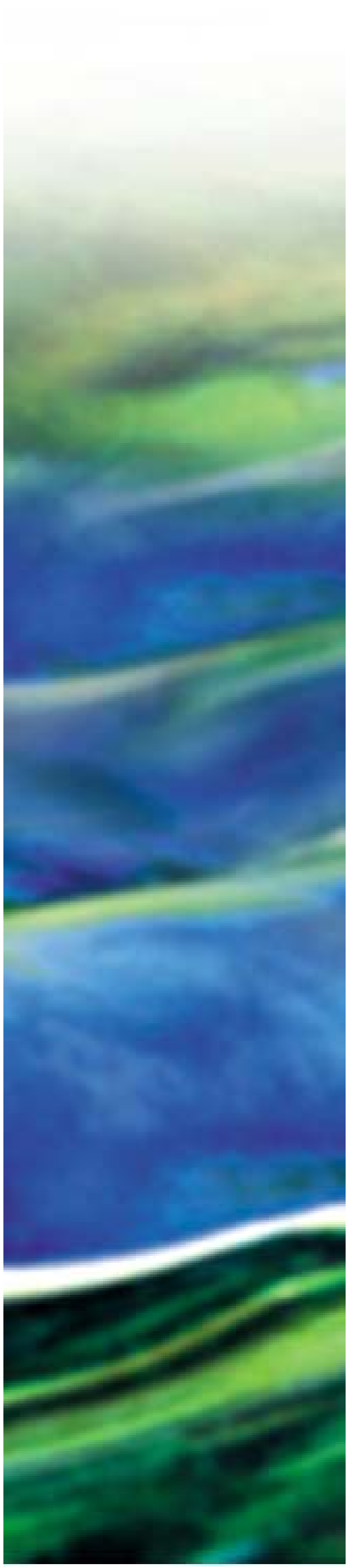

ANTIDEGRADATION ANALYSIS FOR THE EL DORADO HILLS WASTEWATER TREATMENT PLANT

Prepared for:

El Dorado Irrigation District

Prepared by:

ROBERTSON - BRYAN, INC.
Specializing in Water and Power Resources

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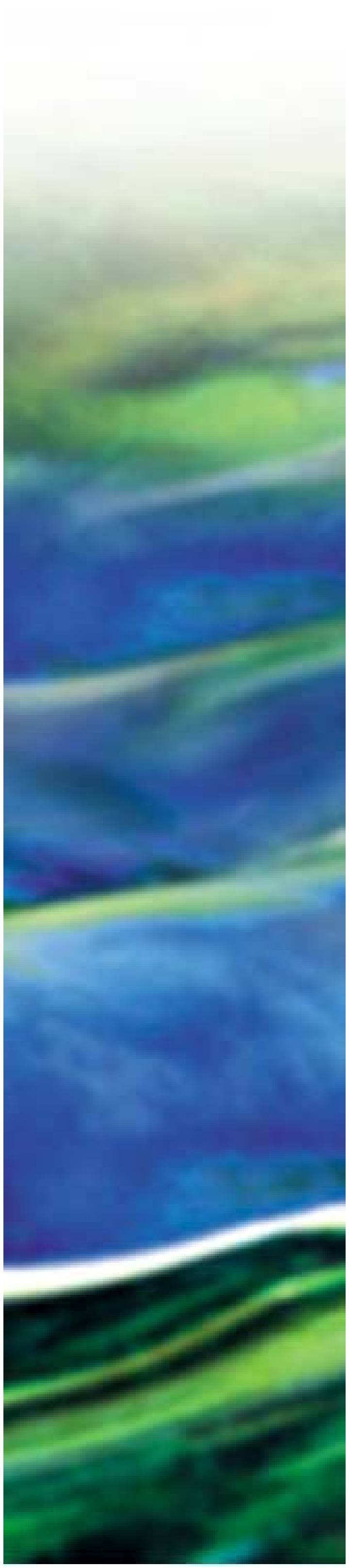

ANTIDEGRADATION ANALYSIS FOR THE EL DORADO HILLS WASTEWATER TREATMENT PLANT

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

ACRONYMS AND ABBREVIATIONS

ADWF	average dry weather flow
APU	Administrative Procedure Update
Basin Plan	Water Quality Control Plan, Central Valley Region, Sacramento River and San Joaquin River Basins
BDCM	bromodichloromethane
BNR	biological nutrient removal
BOD	biochemical oxygen demand
BPTC	best practical treatment or control
CCC	criterion continuous concentration
CMC	criterion maximum concentration
CTR	California Toxics Rule
CVRWQCB	Central Valley Regional Water Quality Control Board
DAF	dissolved air flotation
DBCM	dibromochloromethane
DHS	Department of Health Services
District	El Dorado Irrigation District
DO	dissolved oxygen
EDHWWTP	El Dorado Hills Wastewater Treatment Plant
MBAS	methylene blue active substances
MCL	maximum contaminant level
mgd	million gallons per day
NPDES	National Pollutant Discharge Elimination System
NTR	National Toxics Rule
NTU	Nephelometric Turbidity Unit
POTWs	publicly owned treatment works
RWQCB	Regional Water Quality Control Board
SARWQCB	Santa Ana Regional Water Quality Control Board
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
U.S. EPA	United States Environmental Protection Agency
WER	water-effect ratio
WWTP	wastewater treatment plant

1 INTRODUCTION

1.1 Discharger Description

El Dorado Irrigation District (District) owns and operates the El Dorado Hills Wastewater Treatment Plant (EDHWWTP), which provides service to El Dorado Hills and adjacent areas. The EDHWWTP is located approximately 30 miles east of Sacramento, in El Dorado Hills. This plant reclaims treated municipal wastewpater for uses within the District, and discharges treated effluent to Carson Creek seasonally, typically from November through April. Carson Creek is tributary to Deer Creek, which is tributary to the Cosumnes River. Wastewater reclamation is regulated under separate waste discharge requirements and must meet the requirements of California Code of Regulations, Title 22.

The EDHWWTP has undergone significant treatment modifications and upgrades in the past few years. The plant was expanded in 1998 to a design capacity of 3.0 million gallons per day (mgd) average dry weather flow (ADWF). In 2003-2004, the plant was upgraded with a biological nutrient removal (BNR) system. The treatment plant consists of headworks, screening and grit removal, two primary clarifiers, two completely nitrifying activated sludge basins, two BNR tanks for removal of nitrogen and phosphorus, two secondary clarifiers, three tertiary filters, two chlorine contact basins, dissolved air flotation (DAF) sludge thickening, sludge holding tank, anaerobic digestion, and a belt filter press. A DAF unit is used to remove algae from the 66 million gallon secondary effluent storage pond prior to filtration.

Currently, the District is designing the plant to expand capacity from 3.0 mgd to 5.4 mgd ADWF to meet increasing flows from a growing number of customers in the collection system and has submitted a Report of Waste Discharge (ROWD) (EID 2005a). An initial phase of construction is anticipated to increase the capacity to 4.0 mgd. The initial expansion will include upgrades and additional unit process throughout most of the facility, including lining the pond and a new UV disinfection system. Additional discharge for the increased effluent flow rate will be accommodated through reclamation, as currently is done for a portion of the discharge. The expansion to 4.0 mgd is in the design phase and is expected to be completed in 2010.

1.2 Purpose of Analysis

The District has proposed increasing the discharge capacity of the EDHWWTP from 3.0 mgd to 4.0 mgd, and is seeking a renewed NPDES permit for discharges to Carson Creek. Hence, the Central Valley Regional Water Quality Control Board (CVRWQCB) has requested an antidegradation analysis be performed in accordance with state and federal policies. This antidegradation analysis has been performed to assess the nature and degree to which increased discharge would result in a lowering of Carson Creek water quality, whether resultant conditions would be protective of the creek's beneficial uses, and whether allowing the potential incremental degradation defined herein would be consistent with maximum benefit to the people of the State, given the economic and social benefits of the project versus the water quality impacts and the cost and feasibility of alternatives.

2 ANTIDEGRADATION POLICY AND GUIDANCE

Antidegradation policies and guidance have been issued at both the federal and state level, as described in the following sections.

2.1 Federal Antidegradation Policy and Guidance

The federal antidegradation policy is designed to protect existing uses and the level of water quality necessary to protect existing uses, and provide protection for higher quality and outstanding national water resources. The federal policy directs states to adopt a statewide policy that includes the following primary provisions; these provisions have since become used to classify water body quality as Tier 1, Tier 2, or Tier 3 waters (Title 40 of the Code of Federal Regulations, Section 131.12 (40 CFR 131.12)):

(1) Existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected. **[Tier 1]**

(2) Where the quality of waters exceed levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the State finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the State's continuing planning process, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing such degradation or lower water quality, the State shall assure water quality adequate to protect existing uses fully. Further, the State shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control. **[Tier 2]**

(3) Where high quality waters constitute an outstanding national resource, such as waters of national and State parks and wildlife refuges and waters of exceptional recreational or ecological significance, that water quality shall be maintained and protected. **[Tier 3]**

(4) In those cases where potential water quality impairment associated with a thermal discharge is involved, the antidegradation policy and implementing method shall be consistent with Section 316 of the Act.

The United States Environmental Protection Agency (U.S. EPA), Region 9 published *Guidance on Implementing the Antidegradation Provisions of 40 CFR 131.12* (USEPA 1987). The document provides general program guidance for states in Region 9 on developing procedures for implementing antidegradation policies.

In August 2005, the U.S. EPA issued a memorandum discussing Tier 2 antidegradation reviews and significance thresholds (U.S. EPA 2005). The use of a 10% reduction in available assimilative capacity as a significance threshold was considered "to be workable and protective in identifying those significant lowerings of water quality that should receive a full tier 2 antidegradation review, including public participation" (U.S. EPA 2005).

> *Given the different approaches states and tribes have taken recently to define significance, it is important to clarify that the most appropriate way to define a significance threshold is in terms of assimilative capacity…Further, given the importance of public participation and transparency, it is clear that a definition of significance that directly links to the resource to be protected (assimilative capacity) is more likely to be understood by the public (U.S. EPA 2005).*

2.2 State Antidegradation Policy and Guidance

2.2.1 Resolution No. 68-16

The State Water Resources Control Board (SWRCB) has interpreted Resolution No. 68-16 to incorporate the federal antidegradation policy (CVRWQCB 1998). Resolution No. 68-16 states, in part:

1. *Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality will be maintained until it has been demonstrated to the State that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use of such water and will not result in water quality less than that prescribed in the policies.*

2. *Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained.*

2.2.2 1987 Policy Memorandum

In 1987, the SWRCB issued a policy memorandum to the RWQCBs to provide guidance on the application of the federal antidegradation policy for SWRCB and RWQCB actions, including establishing water quality objectives, issuing NPDES permits, and adopting waivers and exceptions to water quality objectives or control measures. In conducting these actions, the RWQCBs must assure full protection of existing instream beneficial uses, that the lowering of water quality is necessary to accommodate important economic or social development, and that outstanding national resource waters be maintained and protected.

2.2.3 Administrative Procedures Update 90-004

In 1990, the SWRCB issued guidance to the RWQCBs for implementing Resolution No. 68-16 in NPDES permitting in Administrative Procedures Update (APU) 90-004. The guidance requires the RWQCBs to determine the need to make findings as to whether water quality degradation is permissible when balanced against benefit to the public. APU 90-004 describes two types of antidegradation analyses – a “simple” analysis and a “complete” analysis.

Need for a Complete Antidegradation Analysis

A complete antidegradation analysis is required if the proposed activity results in:

1. *A substantial increase in mass emissions of a pollutant, even if there is no other indication that the receiving waters are polluted; or*
2. *Mortality or significant growth or reproductive impairment of resident species.*

In particular, an antidegradation finding [based on a complete analysis] *should be made and, if necessary, an analysis should be conducted when performing the following permit activities:*

1. *Issuance of a permit for any new discharge, including Section 401 certifications; or*
2. *Material and substantial alterations to the permitted facility, such as relocation of an existing discharge; or*
3. *Reissuance or modification of permits which would allow a significant increase in the concentration or mass emission of any pollutant in the discharge.*

A complete antidegradation analysis will not be required if:

1. *A Regional Board determines that the reduction of water quality will be spatially localized or limited with respect to the waterbody; e.g., confined to the mixing zone; or*
2. *A Regional Board determines the reduction in water quality is temporally limited and will not result in any long-term deleterious effects on water quality; e.g., will cease after a storm event is over; or*
3. *A Regional Board determines the proposed action will produce minor effects which will not result in a significant reduction of water quality; e.g., a POTW has a minor increase in the volume of discharge subject to secondary treatment; or*
4. *The Regional Board determines that the proposed activity, which may potentially reduce water quality, has been approved in the General Plan of a political subdivision and has been adequately subjected to the environmental and economic analyses in an environmental impact report (EIR) required under the California Environmental Quality Act (CEQA). If the Regional Board finds the EIR inadequate, the Regional Board must supplement this information to support the decision.*

The District is seeking reissuance of an NPDES permit for discharge of treated effluent from the EDHWWTP to Carson Creek, including an increase in allowable discharge capacity from 3.0 mgd to 4.0 mgd (ADWF). This is a 33% increase in allowable discharge capacity; hence, a complete antidegradation analysis has been performed and is presented herein.

Elements of a Complete Antidegradation Analysis

APU 90-004 describes the procedure for a complete antidegradation analysis. There are three main elements to the complete antidegradation analysis, which are quoted below.

"1. Compare receiving water quality to the water quality objectives established to protect designated beneficial uses.

> *a. If baseline water quality is equal to or less than the quality as defined by the water quality objective, water quality shall be maintained or improved to a level that achieves the objectives. …* **[Tier 1]**
>
> *b. If baseline water quality is better than the water quality as defined by the water quality objective, the baseline water quality shall be maintained unless poorer water quality is necessary to accommodate important economic or social development and is considered to be of maximum benefit to the people of the State.* **[Tier 2]**

2. Balancing the proposed action against the public interest.

> *a. Past, present, and probable beneficial uses of the water.*
>
> *b. Economic and social cost, tangible and intangible, of the proposed discharge compared to benefits. …*
>
> *c. The environmental aspects of the proposed discharge must be evaluated.*
>
> *d. The implementation of feasible alternative control measures ….*

3. Report on the antidegradation analysis.

> *a. The water quality parameters and beneficial uses which will be affected by the proposed action and the extent of the impact.*
>
> *b. The scientific rationale for determining that the proposed action will or will not lower water quality.*
>
> *c. A description of the alternative measures that were considered.*
>
> *d. A description of the socioeconomic evaluation.*
>
> *e. The rationale for determining that the proposed action is or is not justified by socioeconomic considerations."*

3 WATER QUALITY STANDARDS

A water quality standard consists of: 1) the designated beneficial uses of a water body to be protected; 2) adopted criterion designed to protect those uses; and 3) an antidegradation policy. The federal and state antidegradation policies are presented in Section 2. The following sections describe the beneficial uses and water quality criteria applicable to the receiving water, Carson Creek.

3.1 Beneficial Uses

The beneficial uses of Carson Creek are designated via the "tributary rule" in the *Water Quality Control Plan (Basin Plan), Central Valley Region, Sacramento River and San Joaquin River Basins* (CVRWQCB 1998). Carson Creek is tributary to Deer Creek, which is tributary to the Cosumnes River (See **Figure 1**). Therefore, the beneficial uses of the Cosumnes River have been designated for Carson Creek. Carson Creek's designated beneficial uses include:

- municipal and domestic supply,
- agricultural irrigation and stock watering,
- contact water recreation,
- non-contact water recreation,
- warm freshwater aquatic habitat,
- cold freshwater aquatic habitat,
- migration and spawning of warm water fish (striped bass, sturgeon, and shad),
- migration and spawning of coldwater fish (salmon and steelhead), and
- wildlife habitat.

3.2 Criteria / Objectives

Applicable water quality criteria adopted by the State of California (called objectives) can be found in the Basin Plan (CVRWQCB 1998). The Basin Plan incorporates, by reference, the Department of Health Services (DHS) maximum contaminant levels (MCLs) as objectives for water bodies designated for use as domestic or municipal water supply. In addition, the U.S. EPA promulgated numeric criteria for priority pollutants in the National Toxics Rule (NTR) and California Toxics Rule (CTR) (U.S. EPA 1992, 2000, 2001). The water quality standards contained in the Basin Plan, NTR/CTR, and DHS MCLs have undergone agency, peer, and public review, and have been adopted by the relevant agency (e.g., RWQCB, U.S. EPA).

Numerous water quality "goals" exist in the literature that have not been adopted by the state or U.S. EPA as water quality "standards." These include U.S. EPA recommended ambient water quality criteria for the protection of aquatic life and human health. The CVRWQCB sometimes uses criteria in determining reasonable potential and developing NPDES permit effluent limitations, particularly if no fully adopted water quality standard exists for a specific.

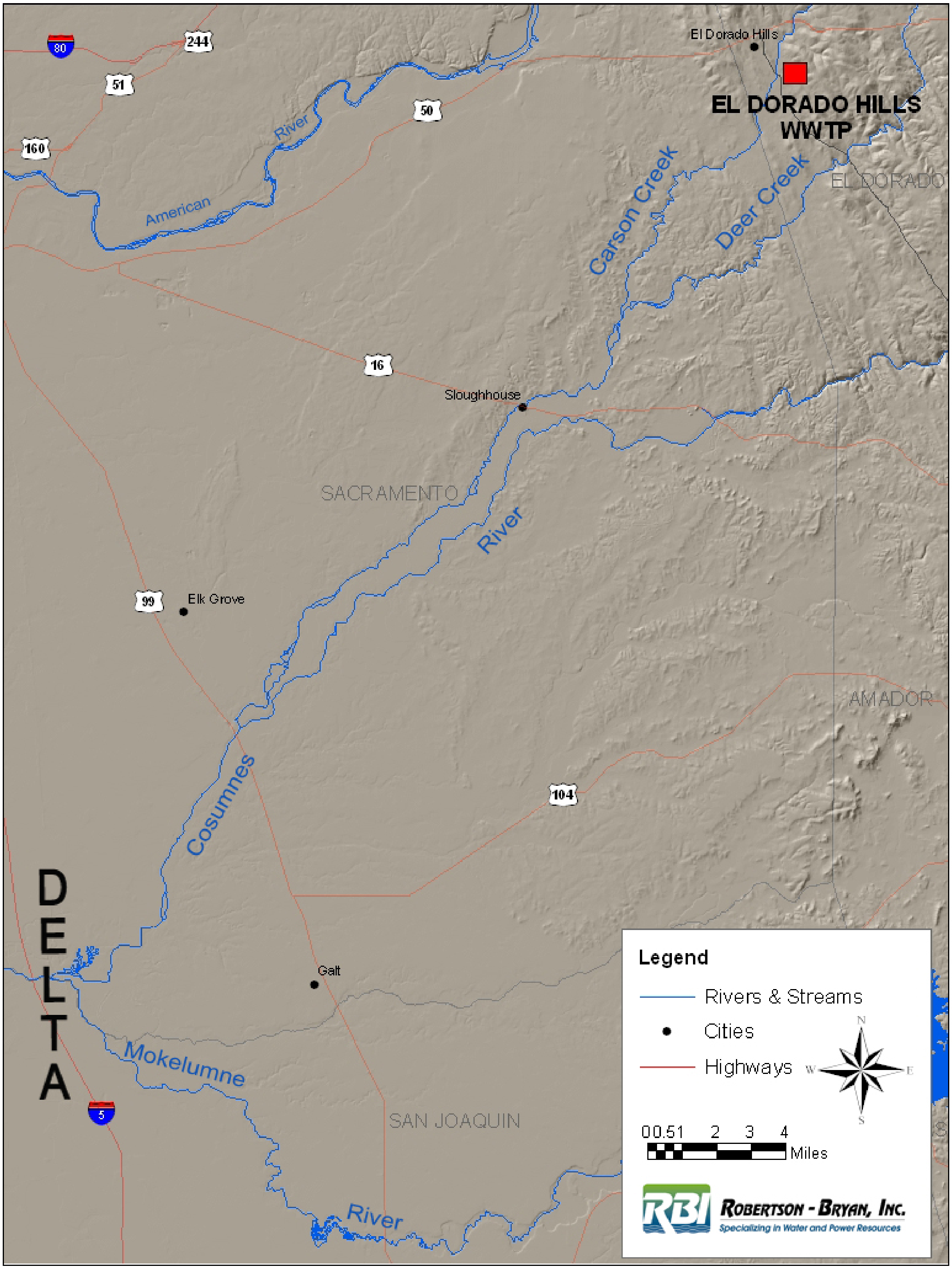


Figure 1. Location of the El Dorado Hills Wastewater Treatment Plant and water bodies downstream of the discharge.

constituent when addressing the narrative toxicity objective in the Basin Plan. For example, California does not currently have a numeric standard for ammonia. Nevertheless, because ammonia can cause toxicity to aquatic life under certain conditions, CVRWQCB commonly applies the U.S. EPA's recommended ambient water quality criteria for ammonia as a means of upholding the Basin Plan's narrative toxicity objective with regards to ammonia.

4 WATER QUALITY ASSESSMENT

The following sections identify the degree to which Carson Creek water quality would be lowered by the proposed increase in effluent discharge, relative to that already permitted, and whether water quality would be protective of the creek's beneficial uses.

4.1 Assessment Approach

This assessment identifies the incremental change in water quality that would occur in Carson Creek due to an increase in the EDHWWTP discharge rate from 3.0 mgd ADWF, the current permitted discharge rate, to 4.0 mgd ADWF. The CVRWQCB previously made antidegradation findings stating that the discharge of 3.0 mgd (ADWF) from the EDHWWTP is consistent with the antidegradation policies. This approach is consistent with APU 90-004, which states, "…*the most recent water quality resulting from permitted action is the baseline water quality to be considered in any antidegradation analysis*" (SWRCB 1990).

The first element of a complete antidegradation analysis is to "[c]*ompare receiving water quality to the water quality objectives*" (SWRCB 1990). California's guidance on antidegradation (APU 90-004) states: *"The baseline water quality should be representative of the water body, accounting for temporal and spatial variability" (page 4).* The Porter-Cologne Water Quality Control Act (2006) provides a definition of water quality as:

> *"'Quality of the water' refers to chemical, physical, biological, bacteriological, radiological, and other properties and characteristics of water which affect its use."*

Thus, to assess the water quality in Carson Creek, it is necessary to consider the beneficial uses and the objectives meant to protect those uses. Generally water quality standards are concentration-based in order to prevent exceedances of concentration-based exposure thresholds. It is also necessary to describe relevant exposure scenarios for the beneficial uses to be protected. This requires defining criteria-dependent critical flows and the criteria-dependent representative averages for assessing water quality.

Although bioaccumulation is considered in the development of human health and aquatic life criteria, the nature of downstream water bodies may facilitate extended residence time or deposition of contaminants. Therefore, for bioaccumulative constituents, mass loadings were also considered in assessing potential lowering of water quality from increased EDHWWTP discharge.

4.2 Mass Balance Assessment of Water Quality

Priority pollutant data are available for Carson Creek upstream of the EDHWWTP outfall (R1 monitoring station) and for the undiluted effluent, but not for Carson Creek downstream of the outfall at the downstream (R2) station. Some parameters (e.g., dissolved oxygen, temperature, turbidity, pH) are measured at the R2 station as part of monthly self-monitoring conducted for the NPDES permit. Therefore, the creek quality under the current and future permitted discharge capacities (i.e., creek quality at the downstream R2 station) is represented by a steady-state, mass-balance of data collected on the effluent and creek at the upstream (R1) monitoring location, unless measured data at the R2 monitoring location are available. The mass-balanced, downstream water quality was determined from the following equation:

$$C_{R2} = \frac{C_{R1} \times Q_{R1} + C_{Effluent} \times Q_{Effluent}}{Q_{R1} + Q_{Effluent}}$$

where:

C= constituent concentration

Q = flow/discharge rate

To assess the significance of any lowering of the water quality, the change in the assimilative capacity, on a constituent-specific basis, for Carson Creek was calculated. The assimilative capacity is the concentration increment between the ambient water quality and the water quality standard (WQS) and is calculated as the change in constituent concentration at R2 (as a result of the plant expansion) divided by the difference between the WQS and R2 (under existing conditions; 3.0 mgd).

$$Assimilative\ capacity = WQS - \frac{(C_{R1} \cdot Q_{R1} + C_{Effluent} \cdot Q_{Effluent})}{(Q_{R1} + Q_{Effluent})}\ \ (at\ 3.0\ mgd)$$

The utilization of assimilative capacity is the change in downstream receiving water concentration, measured at R2, divided by the assimilative capacity.

$$\%\ Assimilative\ Capacity\ used = 100 \cdot \frac{\left(R2_{4.0mgd} - R2_{3.0mgd}\right)}{Assimilative\ capacity}$$

4.2.1 Critical Flows for the Criteria-dependent Protection of Beneficial Uses

NPDES permit limitations assume a worst-case condition of no dilution (zero Carson Creek flow). When there is no flow, there would be no need for an antidegradation analysis as there would be no existing water quality to protect. However, during the period of discharge, the creek usually has some measurable flow (**Appendix A**) and an antidegradation analysis is thus necessary.

The Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (State Implementation Plan or SIP) addresses effluent and receiving water critical flow considerations in the context of the criteria, and thus beneficial uses to be protected (SWRCB 2005).

- Effluent flow ($Q_{Effluent}$) is assessed at 3.0 mgd, the current permitted capacity, and 4.0 mgd, the proposed future permitted capacity.
- Critical flow for acute aquatic life criteria, and acute human health effects, is 1Q10.
- Critical flow for chronic aquatic life criteria is 7Q10.
- Critical flow for long-term human health criteria and other long-term criteria (e.g. agriculture) is the harmonic mean.

For purposes of this analysis, and given the limitations of the existing datasets, Carson Creek critical flow conditions are assessed as follows:

(1) An upstream flow of 0.1mgd, which is the lowest measured flow, is used as the best available representation of the 1Q10 and the 7Q10 flows for protection of acute and chronic aquatic life criteria (and acute human health effects); and

(2) The harmonic mean flow is calculated, when there is upstream flow during discharge conditions, as the critical flow for the protection of long-term human health and other beneficial uses.

The EDHWWTP typically recycles all its wastewater for reuse during the irrigation season and discharges effluent to Carson Creek from November through April, when irrigation demands are reduced or non-existent. The harmonic mean[1] of the creek flow during the November through April period is used since this is when discharge has historically occurred and thus creek flow data are available. The harmonic mean flow for Carson Creek for the period January 2001 through December 2006 is 0.5 mgd.

4.2.2 Criteria-dependent Representative Water Quality Measurements

Acute aquatic life criteria are typically based on 1-hour exposure which is far shorter than the typical monitoring frequency for many constituent. Chronic aquatic criteria are typically based on short-term chronic 4-day exposures. To be protective to aquatic life beneficial use, the maximum, measured effluent and receiving water concentrations are used as a conservative measure of representative water quality.

Long-term human health effects and other long-term criteria (e.g., agriculture) are much less senstitive to short-term exceedances of the criteria. Thus, for long-term human health and other

[1] The harmonic mean is expressed as $\frac{n}{\sum_{i=1}^{n} \frac{1}{x_i}}$ and is used to calculate averages of rates (e.g., flow rates).

effects, the representative water quality is the mean of the measured effluent and receiving water concentrations which reflects the overall, long-term water quality and potential for degradation of beneficial uses.

Many constituents have "non-detect" values in the data set. For purposes of calculating average concentrations, one-half the reporting limit is used for non-detects. For long-term criteria only, if 80 percent or more of constituent's data set is non-detect, then the constituent is not carried forward for further analysis because, at this detection level frequency, the constituent would not exhibit consistent lowering of water quality. Summary statistics for effluent quality and Carson Creek water quality are provided in **Appendix B** and **Appendix C**, respectively.

4.2.3 Summary of Critical Flows and Representative Water Quality Measurements

Table 1 summarizes the critical flows and representative effluent and receiving water quality measurements used to assess potential lowering of water quality from increased EDHWWTP discharge.

Table 1. Summary of critical flows and representative water quality to be used for the criteria-dependent analysis.

Criteria/Beneficial Use	Critical Flow	Representative Flow from Existing Dataset	Representative Effluent and Receiving Water Quality
Acute aquatic life Acute human health	1Q10	0.1 mgd, minimum measured flow	Maximum measured concentration
Chronic aquatic life	7Q10	0.1 mgd, minimum measured flow	Maximum measured concentration
Long-term human health Other long-term criteria	Harmonic mean	0.5 mgd, calculated with 0.1 replacing zero flow events	Mean of measure concentrations

4.3 Mass Loading Assessment of Water Quality

Although bioaccumulation is considered in the development of human health and aquatic life criteria, the nature of downstream water bodies may facilitate extended residence time or deposition of contaminants. This would lead to an accumulation of bioaccumulative constituents in downstream water bodies and/or sediments (see Figure 1). Therefore mass loadings also were considered in order to assess potential lowering of downstream water quality from bioaccumulative constituents in the increased EDHWWTP discharge.

The assessment of available mass loading assimilative capacity is: (1) the maximum mass load, at R2 with the project, that the water body could carry without exceeding the WQC/WQO, (2) minus the upstream load and previously permitted/existing loads.

$$Available\ Mass\ Loading = WQS \cdot \left(Q_{R2,4.0mgd}\right) - \left(Q_{R1} \cdot C_{R1}\right) - \left(Q_{Effluent,3.0mgd} \cdot C_{Effluent,3.0mgd}\right)$$

The mass loading use of assimilative capacity is the new load divided by the assimilative capacity.

$$\%\ Assimilative\ Capacity\ used = 100 \cdot \frac{\left(Load_{4.0mgd} - Load_{3.0mgd}\right)}{Assimilative\ capacity}$$

Carson Creek, Deer Creek, and the Cosumnes River all have periods of interrupted flow. The period of contiguous hydraulic connection between Carson Creek and the Delta is generally from November through April. **Table 2** lists the mean monthly flow that occurs during this period.

Table 2. Water bodies downstream of the El Dorado Hills Wastewater Treatment Plant and mean flows during expected period of hydraulic connectivity (November through April).

Downstream Water Body	Mean Monthly Flow (mgd)	303(d) listed constituents (present in the effluent)
Carson Creek	4.0 [1]	Aluminum, Manganese
Deer Creek	20.7 [2]	Iron
Cosumnes River	529 [3]	None
Eastern Delta	--	DDT, Mercury, Group A pesticides

Notes:
1 Based on EDHWWTP R1 monitoring (1/1/2001 through 4/20/2005).
2 Based on Deer Creek WWTP R1 monitoring (7/10/2001 through 12/16/2002).
3 Based on USGS gauging station dataset at Michigan Bar (10/1907 through 10/2005).

Since mass loading accumulation is a long-term impact, the harmonic mean flow for Carson Creek during the discharge season (0.5 mgd) was used to assess potential long-term transport and impacts of bioaccumulative constituents on downstream water bodies. For similar reasons, the average receiving water and effluent concentrations were used to assess potential long-term impacts of bioaccumulative constituents on downstream water bodies.

4.4 Baseline Effluent and Receiving Water Quality

4.4.1 Existing Water Quality Monitoring Data

Effluent and creek water quality is characterized from monitoring data collected from March 2001 through February 2002 in response to CVRWQCB’s request pursuant to California Water Code Section 13267 (RBI 2002), and Discharger Self-Monitoring Reports from January 2001 through September 2005 (EID 2001, 2002, 2003, 2004, 2005, 2006). The exception to this is ammonia and nitrate, which are represented by data collected from November 2004 to December 2006, to reflect the BNR system installed in 2004. The BNR system also removes nitrite and phosphorus, but no post-upgrade data are available for phosphorus, so the 2001-2002 data are presented. The current permit, authorizing 3.0 mgd discharge capacity, was issued in June 2001.

4.4.2 303(D) Listed and Other Non-High Quality Water Body Constituents

When existing baseline water quality exceeds water quality objectives, the antidegradation analysis triggers maintaining or improving the existing water quality to meet objectives. On a constituent-specific basis, a balancing analysis of the proposed action and the public interest of the State, is not triggered if the receiving water is not high quality.

The SWRCB (2006) has listed Carson Creek as impaired, in accordance with Section 303(d) of the Clean Water Act, due to elevated levels of aluminum and manganese in one or more creek samples that exceed the DHS primary and secondary MCLs. Thus, Carson Creek is not high quality with respect to aluminum and manganese. As such, these constituents are not addressed further in this analysis.

Table 3 lists the constituents in the receiving water that exceed water quality standards upstream of the discharge and thus do not trigger a balancing of the proposed action with public interest of the State. The additional constituents, aldrin, copper (total), and iron, are similarly not addressed further in this analysis. When the receiving water exceeds objectives and the constituent is detected in the effluent (Step 4 in the reasonable potential analysis outlined in the SIP), the SIP independently provides the means to prevent further degradation of the receiving water through the implementation of effluent monitoring for that constituent and may impose effluent limitations. Constituents with proposed effluent limits are discussed in the following section.

Table 3. Constituents in receiving water that exceed water quality standards upstream of the discharge.

Aldrin	Copper (Total)	Manganese (Dissolved)
Aluminum (Total) [1]	Iron (Total)	Manganese (Total) [1]

Notes:
[1] On 2006 303(d) list of impaired water bodies for these constituents.

4.4.3 Baseline Effluent Quality

In response to the District's submittal of the ROWD, CVRWQCB issued a letter (dated November 2, 2006) to the District identifying the findings of a Reasonable Potential Analysis (RPA). This letter identified constituents of concern for which new (or more restrictive) effluent limitations would be stipulated in the NPDES permit. The implementation of effluent limitations is meant to ensure that beneficial uses are protected. **Table 4** lists those constituents for which CVRWQCB has found reasonable potential and thus intends to include effluent limitations, in the renewed NPDES permit.

Table 4. Constituents that will receive new (or more stringent) effluent limitations in the renewed NPDES permit.

Aluminum (Total)	Copper	Iron
Ammonia	Cyanide	Manganese
Bis(2-chloroethyl) ether	Dibromochloromethane	Organochlorine Pesticides [1]
Bis(2-ethylhexyl)phthalate	Dichlorobromomethane	Total Trihalomethanes [2]
Carbon tetrachloride	Electrical conductivity	Zinc

Notes:
[1] Organochlorine Pesticides: 4,4'-DDT, aldrin, alpha-BHC, alpha-endosulfan, beta-BHC, beta-endosulfan, chlordane, dalapon, delta-BHC, endrin aldehyde, endrin, gamma-BHC, heptachlor.
[2] Total Trihalomethanes: bromoform, chloroform, dibromochloromethane, dichlorobromomethane.

For many of the constituents in Table 4, the criteria-dependent representative water quality measurement (as defined in Section 4.2.2) would exceed the relevant criteria indicating there is no assimilative capacity available under the existing baseline conditions. When there is no existing assimilative capacity available, it is not possible to calculate the mass balance percent utilization of assimilative capacity (e.g., division by zero).

When the relevant standard is “non detect,” as is the basin plan objective for the bioaccumulative organochlorine pesticides, then the mass loading assimilative capacity approach is an appropriate way to evaluate impacts for beneficial uses.

When the relevant standard is not zero, an appropriate way to calculate mass balance (i.e., concentration based) assimilative capacity is needed to assess the significance of changes in receiving water quality. Since effluent limitations will be imposed to protect beneficial uses, the effluent will not be able to cause the receiving water quality to exceed the relevant standard and thus the mass balance utilization of assimilative capacity will be capped by the effluent limitation. In this case, using the average concentrations for effluent and receiving water is appropriate because it allows for the calculation of assimilative capacity utilization and is representative of the day-in day-out receiving water quality, including the temporal variability that exists, downstream of the EDHWWTP.

4.5 Incremental Change in Carson Creek Water Quality and Effects on Beneficial Uses

The following sections describe the incremental change in Carson Creek water quality that would occur by increasing the EDHWWTP’s permitted discharge rate from 3.0 mgd ADWF to 4.0 mgd ADWF, and the effect of that increase on water quality.

4.5.1 Mass Balance Constituents

For purposes of this analysis, future effluent quality is assumed to be the same as current effluent quality with the exception of trihalomethanes (THM), which will have effluent concentrations reduced by implementing U.V. disinfection. Therefore, under the NPDES permit’s design flow scenario, in which Carson Creek flow is zero, the creek quality is the same as the effluent quality, and the incremental change in constituent concentrations due to an increase in discharge from 3.0 mgd ADWF to 4.0 mgd ADWF would be zero; therefore, no further degradation would occur from a constituent concentration basis.

When there is creek flow, however, there would be some change to creek water quality, downstream of the discharge, due to an increased discharge rate. **Table 5** presents the incremental change in water quality for detected constituents that have not triggered effluent limitations through the RPA. Table 5 also identifies the available assimilative capacity (criterion minus R2 concentration at 3.0 mgd discharge rate), and the percent of remaining assimilative capacity used by the 1.0 mgd ADWF incremental increase in discharge proposed. **Table 6** presents the incremental change in water quality for constituents with proposed effluent limits. Constituents with long-term effects (e.g., human health constituents based on cancer risk associated with long-term exposures) that have a detection frequency less than 20% in effluent samples (see Section 4.2.2 for basis of this threshold) are not considered to cause a consistent or notable effect. The incremental change in water quality due to discharging these infrequently detected constituents with long-term effects is shown in **Appendix D.**

Table 5. Incremental change in Carson Creek water quality due to future discharges of constituents without effluent limits and comparison to applicable water quality standards.

Constituent	Units	Effluent Detection Frequency	Concentration in Carson Creek (R2) downstream of EDHWWTP Outfall			Lowest Applicable Water Quality Criteria		Assimilative Capacity		Further Analysis
			Current (3.0 mgd) Discharge Rate	Future (4.0 mgd) Discharge Rate	Incremental Increase	Value	Basis	Available	Used by Expansion	
Conventionals										
Chloride	mg/l	100%	62.0	63.2	1.21	250	DHS 2nd MCL	188	1%	N
Fluoride	mg/l	62%	0.072	0.072	0.000	2	DHS MCL	1.93	0%	N
MBAS	mg/l	100%	0.199	0.207	0.008	0.5	DHS 2nd MCL	0.301	3%	N
Nitrite (as N)	mg/l	23%	0.281	0.283	0.002	1	DHS MCL	0.719	0%	N
Phosphorus (Total)	mg/l	100%	1.72	1.79	0.062	na	--	--	--	N
Specific conductance	umhos /cm	100%	671	681	10.7	900	DHS 2nd MCL	229	5%	N
Sulfate (as SO4)	mg/l	100%	50.9	52.0	1.072	250	DHS 2nd MCL	199	1%	N
Sulfide	mg/l	42%	1.56	1.62	0.058	na	--	--	--	N
Sulfite	mg/l	92%	5.88	6.05	0.178	na	--	--	--	N
Trace Metals										
Antimony (Dissolved)	ug/l	78%	0.945	0.978	0.033	6	DHS MCL	5.06	1%	N
Antimony (Total)	ug/l	61%	1.10	1.14	0.040	6	DHS MCL	4.90	1%	N
Arsenic (Dissolved)	ug/l	83%	0.602	0.614	0.012	10	DHS MCL	9.40	0%	N
Arsenic (Total)	ug/l	78%	0.645	0.657	0.012	10	DHS MCL	9.36	0%	N
Barium (Dissolved)	ug/l	94%	5.77	5.60	-0.169	1000	DHS MCL	994	0%	N
Barium (Total)	ug/l	94%	6.14	5.91	-0.237	1000	DHS MCL	994	0%	N
Beryllium (Dissolved)	ug/l	6%	0.145	0.151	0.006	4	DHS MCL	3.86	0%	N
Beryllium (Total)	ug/l	13%	0.214	0.221	0.007	4	DHS MCL	3.79	0%	N
Cadmium (Dissolved)	ug/l	67%	0.605	0.610	0.005	1.4	CTR-AQ-ccc	0.795	1%	N
Cadmium (Total)	ug/l	65%	0.122	0.122	0.000	1.5	CTR-AQ-ccc	1.378	0%	N
Chromium (Dissolved)	ug/l	67%	1.065	1.073	0.008	11 [1]	CTR-AQ-ccc	9.935	0%	N
Chromium (Total)	ug/l	65%	1.054	1.041	-0.013	11.4 [1]	CTR-AQ-ccc	10.346	0%	N
Lead (Dissolved)	ug/l	78%	0.881	0.888	0.007	1.23	CTR-AQ-ccc	0.349	2%	N
Lead (Total)	ug/l	57%	0.624	0.628	0.004	1.4	CTR-AQ-ccc	0.776	1%	N

Table 5. Incremental change in Carson Creek water quality due to future discharges of constituents without effluent limits and comparison to applicable water quality standards.

Constituent	Units	Effluent Detection Frequency	Concentration in Carson Creek (R2) downstream of EDHWWTP Outfall			Lowest Applicable Water Quality Criteria		Assimilative Capacity		Further Analysis
			Current (3.0 mgd) Discharge Rate	Future (4.0 mgd) Discharge Rate	Incremental Increase	Value	Basis	Available	Used by Expansion	
Nickel (Dissolved)	ug/l	100%	9.53	9.60	0.069	30	CTR-AQ-ccc	20.5	0%	N
Nickel (Total)	ug/l	91%	9.19	9.25	0.059	30	CTR-AQ-ccc	20.8	0%	N
Selenium (Dissolved)	ug/l	72%	2.44	2.45	0.016	5	CTR-AQ-ccc	2.56	1%	N
Selenium (Total)	ug/l	65%	3.59	3.62	0.026	5	CTR-AQ-ccc	1.41	2%	N
Silver (Dissolved)	ug/l	39%	0.484	0.488	0.004	1.12	CTR-AQ-cmc	0.636	1%	N
Silver (Total)	ug/l	26%	0.485	0.488	0.003	1.32	CTR-AQ-cmc	0.835	0%	N
Thallium (Dissolved)	ug/l	56%	0.146	0.151	0.005	1.7	CTR-HH	1.55	0%	N
Thallium (Total)	ug/l	48%	0.194	0.201	0.007	1.7	CTR-HH	1.51	0%	N
Organics										
Toluene	ug/l	30%	0.543	0.563	0.020	150	DHS MCL	149	0%	N
Tributyltin	ug/l	33%	0.017	0.018	0.001	0.072	EPA-AQ-ccc	0.055	2%	N
Xylenes	Ug/l	25%	0.404	0.416	0.012	1750	DHS MCL	1750	0%	N

Notes:
CTR-AQ-ccc = California Toxics Rule criterion for the chronic protection of aquatic life. Based on a hardness of 52 mg/L as $CaCO_3$.
CTR-AQ-cmc = California Toxics Rule criterion for the acute protection of aquatic life. Based on a hardness of 52 mg/L as $CaCO_3$.
CTR-HH = California Toxics Rule criterion for the protection of human health (consumption of water and organisms).
DHS MCL = Department of Health Services maximum contaminant level.
DHS 2nd MCL= Department of Health Services secondary maximum contaminant level.
Total Rec. = total recoverable.
na = not applicable, because no assimilative capacity is available.

[1] Aquatic life criteria for hexavalent chromium.

Table 6. Incremental change in Carson Creek water quality due to future discharges of constituents with effluent limits and comparison to applicable water quality standards.

Constituent	Units	Effluent Detection Frequency	Concentration in Carson Creek (R2) downstream of EDHWWTP Outfall			Lowest Applicable Water Quality Criteria		Assimilative Capacity		Further Analysis
			Current (3.0 mgd) Discharge Rate	Future (4.0 mgd) Discharge Rate	Incremental Increase	Value	Basis	Available	Used by Expansion	
Conventionals										
Ammonia	mg/l	2%	0.466 [1]	0.483 [1]	0.017	1.18 [2]	EPA-AQ-ccc	0.704	2%	N
Cyanide	ug/l	13%	2.46 [1]	2.55 [1]	0.091	5.2	CTR-AQ-ccc	2.74	3%	N
Nitrate (as N)	mg/l	100%	5.01	5.18	0.169	10	DHS MCL	4.99	3%	N
TDS (Total dissolved solids)	mg/l	100%	444	310 [7]	-134	450	Basin Plan	5.97	0%	N
Trace Metals										
Aluminum (Dissolved)	ug/l	94%	100	103	3.131	200	DHS 2nd MCL	99.7	3%	N
Aluminum (Total)	ug/l	91%	195	188	-7.488	200	DHS 2nd MCL	4.90	0%	N [5]
Copper (Dissolved)	ug/l	100%	9.77 [1]	10.1 [1]	0.282	5.10	CTR-AQ-ccc	0	na	**Y**
Copper (Total)	ug/l	100%	10.5 [1]	10.7 [1]	0.211	5.34	CTR-AQ-ccc	0	na	N [5]
Iron (Dissolved)	ug/l	77%	24.8	22.0	-2.82	300	DHS 2nd MCL	275	0%	N
Iron (Total)	ug/l	67%	186	149	-37.2	300	DHS 2nd MCL	114	0%	N
Manganese (Dissolved)	ug/l	77%	9.31	8.50	-0.816	50	DHS 2nd MCL	40.7	0%	N [5]
Manganese (Total)	ug/l	83%	15.0	13.1	-1.90	50	DHS 2nd MCL	35.0	0%	N [5]
Mercury (Dissolved)	ug/l	94%	0.134	0.139	0.005	0.05	CTR-HH	0	na	**Y**
Mercury (Total)	ug/l	96%	0.342	0.354	0.012	0.05	CTR-HH	0	na	**Y**
Zinc (Dissolved)	ug/l	100%	21.6 [1]	22.4 [1]	0.753	67	CTR-AQ-cmc	45.4	2%	N
Zinc (Total)	ug/l	100%	37.7 [1]	38.8 [1]	1.10	68.8	CTR-AQ-cmc	31.1	4%	N
Organics										
4,4'-DDT	ug/l	7%	0.008	0.008	0	0	Basin Plan	0	na	N
alpha-Endosulfan	ug/l	20%	0.010	0.011	0.001	0	Basin Plan	0	na	**Y**
Bis(2-chloroethyl) ether	ug/l	7%	0.554	0.575	0.021	0.031	CTR-HH	0	na	**Y**
Bis(2-ethylhexyl)phthalate	ug/l	7%	1.66	1.72	0.061	1.8	CTR-HH	0.137	45%	**Y**
Bromodichloromethane	ug/l	100%	9.26	na [4]	na [4]	0.56	CTR-HH	0	na	N [4]
Carbon tetrachloride	ug/l	4%	0.221	0.229	0.008	0.25	CTR-HH	0.029	28%	**Y**

Table 6. Incremental change in Carson Creek water quality due to future discharges of constituents with effluent limits and comparison to applicable water quality standards.

Constituent	Units	Effluent Detection Frequency	Concentration in Carson Creek (R2) downstream of EDHWWTP Outfall			Lowest Applicable Water Quality Criteria		Assimilative Capacity		Further Analysis
			Current (3.0 mgd) Discharge Rate	Future (4.0 mgd) Discharge Rate	Incremental Increase	Value	Basis	Available	Used by Expansion	
Chloroform	ug/l	100%	52.96	na [4]	na [4]	80 [1]	DHS MCL	27.0 [3]	7%	N [4]
Dibromochloromethane	ug/l	91%	1.02	na [4]	na [4]	0.41	CTR-HH	0	na	N [4]
Endrin Aldehyde	ug/l	20%	0.024	0.025	0.001	0	Basin Plan	0	na	**Y**
gamma BHC	ug/l	27%	0.015	0.015	0.000	0	Basin Plan	0	na	**Y**

Notes:
Basin Plan = Water Quality Control Plan objective for the Sacramento and San Joaquin Rivers basins.
CTR-AQ-ccc = California Toxics Rule criterion for the chronic protection of aquatic life. Based on a hardness of 52 mg/L as $CaCO_3$.
CTR-AQ-cmc = California Toxics Rule criterion for the acute protection of aquatic life. Based on a hardness of 52 mg/L as $CaCO_3$.
CTR-HH = California Toxics Rule criterion for the protection of human health (consumption of water and organisms).
DHS MCL = Department of Health Services maximum contaminant level.
DHS 2nd MCL= Department of Health Services secondary maximum contaminant level.
Total Rec. = total recoverable
na = not applicable, because no assimilative capacity is available

[1] Maximum concentration exceeds criteria/objective, which will preveneted by effluent limits imposed. For purpose of antidegradation analysis, average concentration was used.
[2] Aquatic life criteria for ammonia based on maximum temperature (25.7°C) and max pH (8.0).
[3] Available capacity determined as the difference between the DHS MCL and sum of bromodichloromethane, chloroform, and dibromochloromethane. Bromoform, the remaining trihalomethane compound, was not detected in the effluent.
[4] The conversion to UV disinfection with the proposed expansions is expected to reduce all THMs to non-detects.
[5] Receiving water concentration exceeds the water quality objective and is thus not high quality.
[6] Applies to the sum of the trihalomethane compounds (bromoform, bromodichloromethane, chloroform, and dibromochloromethane).
[7] The conversion to UV disinfection is expected to reduce TDS on average 160 mg/L based on recent experience at Deer Creek WWTP (due to the elimination of the use of sodium hypochlorite and sodium bisulfite).

For each constituent in Table 5 and Table 6, a determination has been made about the significance of the change in water quality. If further analysis is needed, it is so noted and will be discussed in later sections. As shown in Table 5, increasing the EDHWWTP discharge to Carson Creek from 3.0 mgd to 4.0 mgd would not result in lowered water quality at or above the 10% assimilative capacity significance threshold for any constituents that do not have proposed effluent limits in the tentative NPDES permit.

The constituents with proposed effluent limitations [bis(2-chloroethyl)ether, bis(2-ethylhexyl)phthalate, BDCM, carbon tetrachloride, chloroform, DBCM, mercury, and persistent organochlorine pesticides] are discussed further because these constituents would have concentrations either exceed the assimilative capacity significance threshold or the use of assimilative capacity can not be calculated (Table 6**)**. With the higher 4.0 mgd discharge rate, the remaining constituents would have either an improvement (i.e., lowered creek concentration) or essentially no change in creek concentrations downstream of the discharge.

4.5.2 Mass Loading Constituents

Bioaccumulative constituents detected in EDHWWTP effluent are listed in **Table 7.** For both mercury and selenium, the area with the greatest likelihood of contributing to existing concerns is in the Delta. Although the organic forms of mercury and selenium have the greatest potential to bioaccumulate, inorganic monitoring data is more readily available and can be indicative of potential impacts. Most "persistent, chlorinated pesticides" have significant potential to bioaccumulate and have a "non-detect" criteria in the basin plan.

Table 7. Bioaccumulative and other constituents that have been detected in El Dorado Hills WWTP effluent and will be analyzed for the potential to affect downstream water body concentration or accumulate in sediments.

4,4'-DDT	Chlordane	Heptachlor
Aldrin	Dalapon	Mercury
alpha-BHC	delta-BHC	Selenium
alpha-Endosulfan	Endrin	TDS (Total Dissolved Solids)
beta-BHC	Endrin Aldehyde	
beta-Endosulfan	gamma BHC	

[1] On 2006 303(d) list of impaired water bodies for these constituents.

Table 8 presents the assessment of increased mass loadings of bioaccumulative constituents on incremental change in Carson Creek water quality. As shown in Table 8**,** increasing the discharge from the EDHWWTP to Carson Creek from 3.0 mgd to 4.0 mgd would not result in lowering water quality at or above the 10% assimilative capacity significance threshold for selenium (dissolved and total) or dalapon. TDS loading will decrease with the plant expansion as detailed in Section 4.5.3. For mercury, the plant expansion does show a lowering of more than 10% assimilative capacity. However, for the remaining bioaccumulative constituents analyzed, there is no assimilative capacity available within Carson Creek. For 4,4'-DDT and the other organochlorine pesticides, there is no assimilative capacity because the Basin Plan objective for these constituents is "non-detect."

Table 8. Incremental change in Carson Creek water quality, on a mass loading basis, due to future discharges of bioaccumulative constituents.

Constituent	Effluent Detection Frequency	Mass Loading to Carson Creek (lbs/day x 10^{-3}) Current (3.0 mgd) Discharge Rate	Mass Loading to Carson Creek (lbs/day x 10^{-3}) Future (4.0 mgd) Discharge Rate	Net Increase in Loading (lbs/day x 10^{-3})	Lowest Applicable Water Quality Criteria: Criteria lbs/mil gal	Lowest Applicable Water Quality Criteria: Basis	Assimilative Capacity: Available lbs/mil gal	Assimilative Capacity: Used by Expansion	Further Analysis
Conventionals									
TDS (Total dissolved solids)	100%	12,000 (lbs/day)	10,700 (lbs/day)	-1300 (lbs/day)	3760	Basin Plan	3950	na	N
Trace Metals									
Mercury (Dissolved)	94%	3.9	5.2	1.3	0.0042	CTR-HH	na	na	**Y**
Mercury (Total)	95%	10.0	13.0	3.3	0.0042	CTR-HH	na	na	**Y**
Selenium (Dissolved)	72%	25.0	33.0	8.4	0.042	CTR-AQ-ccc	0.161	5%	N
Selenium (Total)	65%	36.0	48.0	11.9	0.042	CTR-AQ-ccc	0.151	8%	N
Organics									
4,4'-DDT	7%	0.220	0.290	0.074	0	Basin plan	--	na	**Y**
Aldrin	7%	0.094	0.120	0.026	0	Basin plan	--	na	N [1]
alpha-BHC	13%	0.140	0.190	0.048	0	Basin plan	--	na	**Y**
alpha-Endosulfan	20%	0.300	0.400	0.099	0	Basin plan	--	na	**Y**
beta-BHC	7%	0.097	0.130	0.0321	0	Basin plan	--	na	**Y**
beta-Endosulfan	13%	0.240	0.320	0.079	0	Basin plan	--	na	**Y**
Chlordane	7%	0.960	1.30	0.340	0	Basin plan	--	na	**Y**
Dalapon	8%	190	250	63.0	1.7	DHS MCL	7.32	1%	N
delta-BHC	7%	0.071	0.095	0.024	0	Basin plan	--	na	**Y**
Endrin	7%	0.150	0.190	0.049	0	Basin plan	--	na	**Y**
Endrin Aldehyde	20%	0.700	0.930	0.233	0	Basin plan	--	na	**Y**
gamma BHC	27%	0.430	0.580	0.144	0	Basin plan	--	na	**Y**
Heptachlor	13%	0.240	0.330	0.081	0	Basin plan	--	na	**Y**

Notes:
Basin Plan = Water Quality Control Plan objective for the Sacramento and San Joaquin Rivers basins.
CTR-AQ-ccc = California Toxics Rule criterion for the chronic protection of aquatic life. Based on a hardness of 52 mg/L as $CaCO_3$.
CTR-HH = California Toxics Rule criterion for the protection of human health (consumption of water and organisms).
DHS MCL = Department of Health Services maximum contaminant level.
Total Rec. = total recoverable
na = not applicable, because no assimilative capacity is available.
[1] Receiving water concentration exceeds the water quality objective and is thus not high quality.

The following bioaccumulative constituents, primarily persistent organochlorine pesticides, trigger further analysis: 4,4'-DDT; BHC (alpha, beta, delta, and gamma); alpha- and beta-endosulfan; chlordane; endrin; endrin aldehyde; heptachlor; and mercury.

4.5.3 Effects of Receiving Water Quality Changes on Beneficial Uses

Mercury

The most stringent applicable water quality criterion for mercury is the CTR human health criterion (consumption of water and organisms) of 0.050 μg/L. Concentrations in Carson Creek and the EDHWWTP effluent are well below this criterion. However, mercury mass loads are of concern, because mercury is known to bioaccumulate in fish tissue. The Sacramento-San Joaquin Delta is currently listed as impaired due to mercury and CVRWQCB is developing a total maximum daily load for the Delta (CVRWQCB 2005). Carson Creek is tributary to Deer Creek, which is tributary to the Cosumnes River, which is tributary to the Delta. Carson Creek itself has not been identified as impaired due to mercury.

Increased discharges from the EDHWWTP would contribute an additional mass load of mercury to Carson Creek. Applying the average effluent mercury concentration of 0.00178 μg/L at the additional incremental discharge rate of 1.0 mgd (future permitted capacity of 4.0 mgd minus the current permitted capacity of 3.0 mgd), results in an annual increase in mercury load of 0.0054 pounds per year (0.0025 kilograms (kg) per year). By comparison, annual mercury loads to the Delta from tributary and in-Delta sources are approximately 222 kg per year (CVRWQCB 2005). Thus, the increment from the EDHWWTP expansion would constitute less than 0.0012% of the annual Delta load. As such, and based on mercury dynamics in the Delta, the incremental increase in mercury load would not have a measurable or meaningful effect on mercury fish tissue concentrations in Delta waters and, therefore, would not adversely affect beneficial uses.

Copper

The beneficial uses of Carson Creek most sensitive to copper concentrations are aquatic life uses. The most stringent applicable water quality criteria for copper are the CTR criteria for aquatic life, which are a function of site water characteristics. Upstream copper concentrations have exceeded the applicable water quality criteria. Downstream dissolved copper concentrations are projected to increase, on average, by 0.5 μg/L, from 10.1 μg/L to 10.6 μg/L under the expanded discharge. The CTR criterion for chronic protection of aquatic life, based on the average future hardness of 72 mg/L (as $CaCO_3$), is 6.8 μg/L. The criterion is calculated assuming the CTR's default WER of 1.0 and total-to-dissolved conversion factor of 0.96.

Numerous investigations have found that biologically treated effluents contain sufficient amounts of organic and inorganic matter (e.g., total organic carbon, particulate matter, and humic, fulvic, and amino acids) to complex with or "tie-up" free copper ions, thereby reducing or eliminating copper bioavailability and thus toxicity at copper concentrations similar to that in the EDHWWTP effluent (Hall et al. 1997). Hall et al. (1997) report copper WERs for a number of water bodies receiving municipal effluent discharges under low dilution conditions. Based on these and other findings discussed in their paper, Hall et al. (1997) concluded that biologically treated effluents eliminate copper toxicity with significant additional complexing capability in reserve.

This has been demonstrated in a site-specific WER study conducted for another District WWTP, the Deer Creek Wastewater Treatment Plant. The final WER determined for the tertiary treated effluent was 9.7 (total recoverable copper) and 8.86 (dissolved copper) (RBI 2005). A copper effluent WER determined in 2001 for a WWTP in the Santa Ana Region (Region 8) was 4.39 (SARWQCB 2002).

Based on the information presented above, the copper in the EDHWWTP effluent is not expected to be present in biologically available forms and thus would not be expected to cause toxicity to aquatic life in Carson Creek, regardless of the dilution provided by the creek. Thus, incremental increase in total copper concentrations in Carson Creek under the expanded discharge would not be expected to adversely affect downstream beneficial uses, nor would copper concentrations be expected to exceed the fully adjusted (i.e., WER, translator, and hardness adjusted) copper criteria applicable to the site. Even with the incremental increase in downstream copper concentrations that would result from the higher discharge rate, substantial assimilative capacity for copper is expected to remain available due to the binding capacity of the EDHWWTP effluent, resulting in a site-specific WER that is greater than the unadjusted value of 1.0. As such, beneficial uses will not be adversely affected. As discussed for mercury and other bioaccumulative constituents, the incremental increase in load of copper to Delta waters would be negligible, and would not affect downstream beneficial uses.

Persistent Organochlorine Pesticides

The basin plan objective for persistent organochlorine pesticides is “non-detect”. The sources of the organochlorine pesticides in the EDHWWTP effluent are uncertain at this time as most of these pesticides have been banned or do not have current registered uses. Endosulfan II (beta) is still used as an insecticide for vegetables and deciduous fruits and nuts. The infrequent occurrences of the banned pesticides detected in the EDHWWTP effluent suggest that identification of the sources may be difficult to ascertain. For organochlorine pesticides that are detected less than 20% of time, there is no consistent or notable degradation. The total incremental increase in yearly mass loading of persistent organochlorine pesticides associated with EDHWWTP expansion is approximately 10.7 kg/year.

For mercury the incremental increase in load was 0.0025 kg/year or 0.0012% of the annual Delta load. The EDWWTP’s incremental increase in mercury load to Delta waters is a negligible fraction of the Sacramento-San Joaquin River watershed loads. Although similar watershed-wide source loading data is not available for persistent organochlorine pesticides, it is expected that the incremental increase in load for these constituents to downstream waters would be similarly small.

TDS: Total Dissolved Solids

The beneficial use of Carson Creek most sensitive to TDS is agriculture. The basis for the criteria is a long-term average assuming no rainfall and other site assumptions. The relevance of this criterion has not been assessed in relation to site-specific characteristics. However, effluent limitations have been proposed that would conservatively protect agricultural beneficial uses.

However, the conversion to UV disinfection will significantly reduce effluent TDS because sodium hypochlorite and sodium bisulfite will be eliminated from use at the plant. Based on the recent experience at another District plant, Deer Creek WWTP which converted to UV disinfection in August 2006, this reduction, on average, is expected to be 160 mg/L.

The EC:TDS ratio for the World Health Organization agricultural goal 700 µS/cm EC (450 mg/L TDS) is 1.56. Using this as a conversion factor between EC and TDS, Deer Creek effluent previously ranged from approximately 650 to 750 umhos/cm (417 to 481 mg/L as TDS). With conversion to UV disinfection the effluent EC is now ranging from 400 to 500 umhos/cm (256 to 321 mg/L as TDS).

Because TDS is a conservative constituent, for which the cumulative effects of POTW discharges can affect downstream TDS concentrations and loads, an assessment of TDS showing the reduction on a mass loading basis was also calculated (Table 8).

Bis (2-ethylhexyl phthalate) and Carbon Tetrachloride

Bis (2-ethylhexyl phthalate) and carbon tetrachloride were detected infrequently (7% and 4%), have proposed effluent limitation, and the relevant criteria are long-term human health-based criteria. Consequently, beneficial uses will be protected under the planned expansion by the effluent limitations. Moreover, the very limited frequency of detection further lessens any concern for adverse effects to the MUN beneficial use, based on effects on the long-term concentrations in Carson Creek and downstream waters.

Bromodichloromethane, Chloroform, and Dibromochloromethane

The conversion from chlorine disinfection to UV disinfection at the EDHWWTP is expected to reduce the effluent concentrations of these chlorine-disinfection byproducts to near non-detect levels, and below the applicable criteria. In comparison to existing water quality where exceedances of the applicable criteria are common, this would result in a significant improvement in Carson Creek water quality. As such, beneficial uses of Carson Creek and downstream waters will not be adversely affected under the expanded discharge.

pH

The NPDES permit for the EDHWWTP has an effluent limitation that requires discharges to have a pH between 6.5 and 8.5. Based on the current science regarding pH requirements of freshwater aquatic life, the beneficial use of Carson Creek most sensitive to pH, the Central Valley CVRWQCB is processing a Basin Plan amendment that will remove the 0.5-unit change requirement of the current pH objective, leaving the component that requires controllable factors affecting water quality to maintain receiving water pH between 6.5 and 8.5 units (CVRWQCB 2002). Because the permit requires effluent discharged to Carson Creek to have a pH between 6.5 and 8.5, future discharges, regardless of volume, would not cause Carson Creek pH to fall outside this range. This is confirmed by the measured Carson Creek and effluent pH levels presented in **Table 9**. Only two effluent pH measurements out of 1070 have been below 6.5. Both the effluent and creek pH ranges are similar. Thus, the incremental increase in discharge would not result in a lowering of water quality with respect to pH. As such, beneficial uses of Carson Creek and downstream waters will not be adversely affected by the incremental change in pH under the expanded discharge.

Table 9. pH levels in Carson Creek and the El Dorado Hills Wastewater Treatment Plant effluent.

Parameter	Effluent	Carson Creek Upstream of Outfall (R1)	Carson Creek Downstream of Outfall (R2)
Count	1070	160	159
Mean	7.1	7.5	7.4
Median	7.1	7.5	7.4
Minimum	6.2	6.5	6.5
Maximum	8	8.2	8.1

Carson Creek data collected weekly from January 1, 2001 through December 27, 2006 during periods of discharge.
Effluent data collected daily from January 1, 2001 through December 31, 2006 during periods of discharge.

Dissolved Oxygen

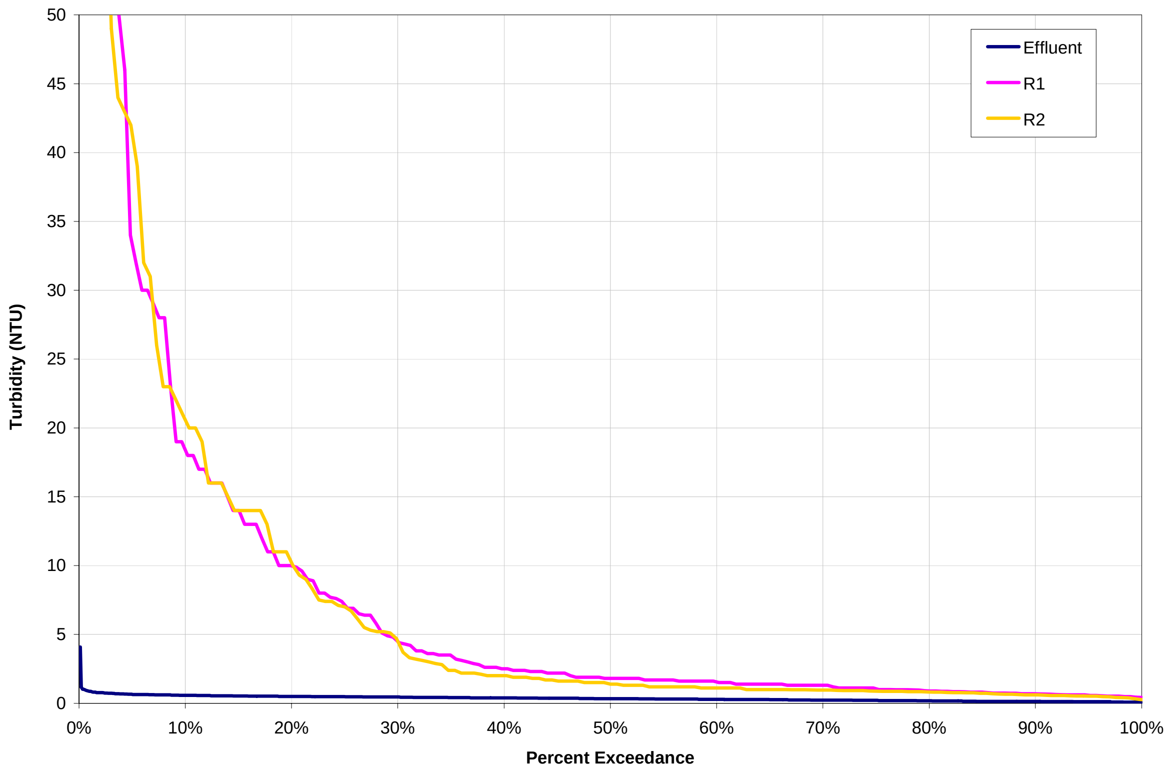
The components of wastewater with the potential to affect dissolved oxygen (DO) concentrations include biochemical oxygen demand (BOD) and ammonia. The NPDES permit contains monthly average (30 mg/L), weekly average (45 mg/L), and daily average (60 mg/L) effluent limits for BOD, and limits for ammonia, based on the U.S. EPA's recommended water quality criteria for aquatic life. The NPDES permit also has a DO limitation for Carson Creek that states the discharge shall not cause the DO to fall below 7.0 mg/L, which is derived from the Basin Plan objective for DO.

The EDHWWTP produces Title 22 quality, tertiary-treated effluent characterized by low concentrations of BOD (typically less than 4 mg/L) and ammonia (typically less than 0.5 mg/L as nitrogen). Re-aeration of downstream waters due to physical processes and photosynthesis tends to offset the oxygen demand of effluent as it flows downstream. As discharge rates increase in the future, the proportion of creek water constituted by effluent also would increase, thereby increasing the relative portion of BOD and ammonia load. Thus, the incremental increase in discharge could result in the lowering of water quality with respect to DO. Available information is insufficient to determine if creek DO levels would be reduced below Basin Plan objectives, due to the discharge, or below levels affecting beneficial uses because the resulting downstream DO levels in the creek are a complex function of creek and effluent DO levels, re-aeration provided by the creek, temperature, photosynthetic activity, and benthic respiration rates, among other factors.

Nevertheless, based on available data, the seasonal discharge, and downstream DO data available for other similar foothill discharges during the discharge period, the incremental increase in discharge rate is not expected to reduce downstream Carson Creek DO to levels that would adversely affect beneficial uses. Any incremental DO load that would potentially cause a "sag" in downstream DO concentrations would occur within Carson Creek, and thus would not affect DO levels in Deer Creek the Cosumnes River, or the Delta due to full assimilation of the DO demand within Carson Creek and to continued downstream re-aeration, photosynthesis, etc.

4.5.4 Turbidity

The EDHWWTP produces Title 22 quality, tertiary-treated effluent characterized by low turbidity levels, typically less than 1 Nephelometric Turbidity Unit (NTU), which is well below the turbidity levels of Carson Creek during the discharge season (**Figure 2**). As such, the incremental increase in discharge from the EDHWWTP would not cause increases in creek turbidity above that which currently occurs, and would not cause an exceedance of Basin Plan objectives for turbidity. Thus, the incremental increase in discharge would not result in a lowering of water quality with respect to turbidity.



Effluent data collected daily and Carson Creek data collected weekly from January 1, 2001, through December 27, 2006, during periods of discharge.
R1 = Carson Creek upstream of outfall
R2 = Carson Creek downstream of outfall

Figure 2. Percent exceedance of turbidity levels in Carson Creek and the El Dorado Hills Wastewater Treatment Plant effluent.

4.5.5 Temperature

The temperature of Carson Creek downstream of the EDHWWTP outfall is dependent on upstream creek and effluent discharge flow rates and temperatures. The Basin Plan's temperature objective states, *"At no time or place shall the temperature of COLD or WARM intrastate waters be increased more than 5ºF above natural receiving water temperature."* While the EDHWWTP has a high degree of compliance with this objective, it is not well supported by the current science on the protection of aquatic life, nor is it consistent with U.S. EPA's recommendations for regulating thermal effects of discharges. It is the resulting downstream temperature regime within Carson Creek that is of interest in terms of assessing thermal effects of the discharge on downstream beneficial uses, the most sensitive of which is the aquatic life use.

Table 10 summarizes Carson Creek water temperatures upstream and downstream of the discharge, under historic operations. Average temperatures downstream of the outfall are higher than those upstream, typically by 1-2ºF, and always by less than 5ºF. Likewise, R1 and R2 minimum and maximum temperatures are generally similar. Current temperature conditions within the creek, based on available R1 and R2 temperature data, indicate thermal effects at levels that would not be expected to adversely affect downstream beneficial uses, including aquatic life uses.

Table 10. Carson Creek temperature upstream (R1) and downstream (R2) of the El Dorado Hills Wastewater Treatment Plant outfall.

	Jan	Feb	Mar	Apr	May	Nov	Dec
Count							
R1 & R2 [1]	28	24	26	17	10	25	26
Average (ºF)							
R1 [1]	50.2	50.6	54.7	56.8	63.9	55.9	52.7
R2 [1]	51.8	52.0	56.0	57.5	65.1	58.8	54.2
Minimum (ºF)							
R1 [1]	40.5	45.0	49.1	52.0	53.4	46.4	46.8
R2 [1]	41.9	45.1	49.6	52.0	56.7	49.8	50.2
Maximum (ºF)							
R1 [1]	60.4	55.6	61.0	60.6	74.3	62.6	61.0
R2 [a]	61.7	56.5	64.8	62.4	74.6	66.6	61.2

[1] R1 and R2 data collected weekly from January 1, 2001 through December 27, 2006 during periods of discharge.

With an incremental increase in discharge, temperatures downstream of the outfall could further increase, relative to historic conditions. Whether resultant future R2 creek temperatures under a 4.0 mgd discharge scenario would adversely affect aquatic life beneficial uses cannot be definitively determined from available information. More detailed information on the aquatic communities within Carson Creek and additional creek temperature data (i.e., measurements taken more frequently than weekly) that better define the creek's temperature regimes during the discharge season would be needed to definitively address the degree of temperature degradation that would occur, and its effects on aquatic life beneficial uses. In addition, any future assessments/antidegradation determinations with regards to temperature should be consistent with Section 316 of the Act. Nevertheless, based on the relatively small temperature changes that have occurred historically and would be expected to occur under the expanded permitted capacity, no significant adverse thermal effects to aquatic life used would be expected to occur.

For all other constitutes addressed in Table 5 and Table 6, but not specifically addressed above, the resultant downstream constituent concentration/level changes that would occur following the incremental increase in discharge from 3.0 mgd to 4.0 mgd would be minor, and thus would be protective of beneficial uses. In addition, a substantial amount of assimilative capacity would remain for each constituent.

5 EVALUATION OF BEST PRACTICAL TREATMENT OR CONTROL

5.1 Applicable Regulations

The term "best practical treatment or control" (BPTC) appears in the state's antidegradation policy (Resolution No. 68-16):

> *"Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in <u>best practicable treatment or control</u> of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the state will be maintained."* [emphasis added]

However, nowhere is state regulations or policies has BPTC been defined in terms of specific treatment processes for specific constituents, or in terms of specific effluent quality.

Sections 301, 302, 306, and 307 of the Clean Water Act incorporates technology-based effluent limits according to "best practical control technology," "best available technology economically achievable," and "best conventional pollutant control technology economically achievable;" however, these terms are used in the context of regulating discharges from point sources other than publicly owned treatment works (POTWs).

For POTWs, Section 301(b)(1)(B) of the Clean Water Act requires that secondary treatment standards be met. Secondary treatment standards are defined by numeric effluent limitations for the pollutant parameters 5-day biological oxygen demand, suspended solids, and pH (40 CFR 133.102). More stringent limitations beyond those required to meet the definition of secondary treatment may be incorporated, if necessary, to achieve certain water quality standards [Section 301(b)(1)(C) of the Clean Water Act].

Permits shall contain the following technology-based treatment requirements in accordance with the following statutory deadlines (40 CFR 125.3(a)(1)):

(i) Secondary treatment--from date of permit issuance; and

(ii) The best practicable waste treatment technology--not later than July 1, 1983.

Best practicable waste treatment technology is defined as (40 CFR 35.2005):

> *The cost-effective technology that can treat wastewater, combined sewer overflows and non-excessive infiltration and inflow in publicly owned or individual wastewater treatment works, to meet the applicable provisions of:*
>
> *(i) 40 CFR part 133--secondary treatment of wastewater;*
>
> *(ii) 40 CFR part 125, subpart G--marine discharge waivers;*
>
> *(iii) 40 CFR 122.44(d)--more stringent water quality standards and State standards; or*
>
> *(iv) 41 FR 6190 (February 11, 1976)--Alternative Waste Management Techniques for Best Practicable Waste Treatment (treatment and discharge, land application techniques and utilization practices, and reuse).*

Thus, in the state and federal regulations, achievement of "best practical treatment or control" and "best practicable waste treatment technology" are defined in terms of performance and maintenance of water quality standards, rather than specific treatment technologies.

5.2 Findings

The EDHWWTP produces Title 22 quality, tertiary-treated effluent suitable for unrestricted reuse. Most recently, the plant was upgraded to include BNR, to reduce nitrogen and phosphorus compounds. In addition, the EDHWWTP minimizes discharges to Carson Creek through maximizing reuse of recycled wastewater within the District for irrigation purposes, typically recycling 100% of effluent for six months of the year.

Because the EDHWWTP is an advanced treatment plant that produced Title 22 quality, tertiary-treated effluent suitable for unrestricted reuse, because the plant is operated to maximize the use of recycled water and minimize discharges to surface waters and will continue to do so in the future, because the plant's facilities and effluent quality meet or exceed the regulations discussed in Section 5.1, and because current and future expected operations of the plant will achieve compliance with NPDES permit requirements, thereby assuring a water quality nuisance will not occur and the highest water quality consistent with maximum benefit to the people of the region and the state will be maintained, it is determined that the current and planned future facilities and operations of the EDHWWTP are consistent with BPTC as it is defined and intended in Resolution No. 68-16.

6 SOCIOECONOMIC CONSIDERATIONS

6.1 Constituents Evaluated for a Socioeconomic Analysis

To assess potential lowering of Carson Creek water quality, a mass balance, and where appropriate, a mass loading assessment of the use of available assimilative capacity was made.

Table 11 summarizes the constituents that warrant further analysis as indicated in Table 5, Table 6, and Table 8.

Table 11. Constituents from Table 5, 6, and 8 that warrant further analysis.

Constituents	Significance Threshold Exceeded	
	Mass Balance	Mass Loading
Metals		
Copper (Dissolved)	X	--
Mercury	X	X
Organics		
4,4'-DDT	--	X
BHC	Gamma	Alpha, beta, delta, gamma
Bis (2-chloroethyl) ether	X	--
Bis (2-ethylhexyl) phthalate	X	--
Carbon tetrachloride	X	--
Chlordane	--	X
Endosulfan	Alpha	Alpha, beta
Endrin	--	X
Endrin aldehyde	X	X
Heptachlor	--	X

It should be noted that all the constituents triggering a detailed antidegradation analysis have already been shown by CVRWQCB to have reasonable potential to cause or contribute to exceedances of applicable water quality standards. Therefore, proposed effluent limitations will be applied that will further reduce the potential water quality impacts to Carson Creek, assure water quality criteria/objectives are met, and protect beneficial uses. Since the objective of the socioeconomic analysis is to determine if the lowering of Carson Creek water quality is in the "best interest" of the people of the State, it is necessary to determine if effluent limits will already restrict impacts to meet criteria and thus no assimilative capacity may exist.

If further analysis was triggered by exceeding a 10% assimilative capacity significance threshold, then those constituents are carried forward into the socioeconomic analysis to evaluate the justifications for lowering water quality in Carson Creek. If the objective is "non detect" and effluent limitations have been triggered by RPA, then there truly is no assimilative capacity and also no utility to a socioeconomic justification. If the objective is both a measurable value and effluent limitations have been triggered by RPA, assimilative capacity is calculated both on a criteria-dependent basis and an average basis. When there is no assimilative capacity with either calculation, then there truly is no available assimilative capacity and no utility to a socioeconomic justification. When calculation of assimilative capacity is not relevant to the criteria (e.g. for temperature, pH, etc.), the need for a socioeconomic justification is driven by the significance of the impact to beneficial uses. Based on the above considerations and the constituent-specific discussions in Section 4.5.3, the following constituents require a socioeconomic analysis:

- Bis (2-ethylhexl) phthalate
- Carbon tetrachloride

6.2 Socioeconomic Assessment Approach

The EIR for Phase III expansion of the EDWWTP estimated the cost of improvements necessary to expand and upgrade the plant from 3.0 mgd to 5.4 mgd at $32 million (August 2006). The District has since planned to initially expand to 4.0 mgd. The economic costs for alternatives will be assessed relative to the current project expansion cost estimate of $35.6 million, the increased cost for ratepayers, and the magnitude of the change in ratepayer costs. Alternatives will also be assessed for feasibility of implementation and effectiveness at reducing the lowering of water quality. The social benefits and costs will be assessed based on the ability to accommodate socioeconomic development in the El Dorado County General Plan, the magnitude of the water quality impacts, and the change in water quality from existing conditions.

6.3 Alternatives: Incremental Effects on Water Quality and Socioeconomic Development

Several alternatives were considered that would reduce or eliminate the lowering of water quality, for certain constituents, resulting from the additional 1 mgd of discharge capacity proposed with the plant expansion. These plant expansion alternatives are:

(1) Higher level of treatment using microfiltration;

(2) Zero discharge (100%) recycling of additional plant capacity;

(3) Flow restricted discharge;

(4) Pollutant source minimization;

(5) Connect to Sacramento Regional Wastewater Treatment Plant; and

(6) Change in drinking water source.

Each alternative was assessed for feasibility in implementation and effectiveness in reducing the lowering of water quality. Where necessary, Carollo Engineers (Carollo) provided initial cost estimates for construction of additional plant facilities (**Appendix E**). Engineering and administration cost were assumed to be 20% of the total construction cost estimate. To the extent necessary, these cost estimates do not consider permitting costs needed to complete implementation of the project alternatives.

The costs to implement alternatives can be evaluated three ways: (1) relative to the current project expansion cost estimate of $35.6 million; (2) as the increased cost for ratepayers; (3) and the magnitude of the change in ratepayer costs. In general, the cost to implement alternatives would primarily be borne by the new development that is requiring the plant expansion, thereby possibly prohibiting some of the socioeconomic growth for the area by making it economically impractical for the new development to occur in this area.

6.3.1 Higher Level of Treatment

Microfiltration was considered to assess the initial feasibility of using advanced filtration technologies (i.e., microfiltration, ultrafiltration, reverse osmosis) to reduce the water quality impacts of plant expansion. Cost curves where based on prior Carollo projects and include recent cost experience with the Carmel Area Wastewater District. A 4-mgd microfiltration plant is estimated to have a construction estimate of $37 million and engineering and administration costs of $7.4 million for a total estimated cost of $44.4 million. The annual operation and maintenance cost are estimated to be $2.26 million.

6.3.2 Zero Discharge

Zero discharge through 100% recycling of the additional 1 mgd of plant capacity would require increased demand for recycled water and increased storage capacity. To provide 6 months of storage, prior to the irrigation season, a reservoir of 181 million gallons would be needed. Constructing this additional storage is not possible within the limited footprint of the existing plant. Assuming 5 miles of piping and the reservoir itself, the construction cost is estimated at $31 million with $6.2 million in engineering and administration costs for a total estimated cost of $37.2 million. Annual operations and maintenance costs for the reservoir and pump station are estimated at $930,000. This cost estimate does not include land acquisition costs[2] or right of ways. This is approximately equal to the estimated cost for Phase III expansion, and the costs would be substantial larger when land acquisition and permitting cost are considered. As such, it would more than double the expansion/upgrade costs and thus would more than double increased to ratepayers.

6.3.3 Flow-restricted Discharge

After analysis of Carson Creek flows from November through May, it was determined that sufficiently large dilution flows, necessary to mitigate potential lowering of Carson Creek water quality, occur too in frequently for flow-restricted discharge to be a viable alternative. For example, a 10:1 dilution flow of creek water to effluent (40 mgd in creek, 4 mgd effluent), occurs 5.2% of the time or less. A 10:1 dilution flow was not sufficient to mitigate the lowering of water quality impacts below the available assimilative capacity threshold of significance (10%) for any constituents that exceeded this threshold. Furthermore, greater dilution flow does little to achieve compliance with constituents, like persistent organochlorine pesticides, that have an objective of “non-detect.” In essence, the flow–restricted discharge alternative defaults to the zero-discharge alternative discussed above.

[2] The 181 million gallon reservoir with a depth of 10 feet would require 65 acres.

6.3.4 Pollutant Source Minimization

Pollutant source minimization using different treatment and controls were evaluated. UV disinfection is already being designed in the proposed plant expansion to minimize chorine disinfection byproducts. In addition, the removal of chlorine should reduce cyanide formation and would decrease some of the chemical usage, and thus salt load in the plant. To remove alum as a coagulant from the drinking water treatment process would require microfiltration be installed at the water treatment facility. The construction cost estimate for conversion to microfiltration from coagulation is $36 million with $7.2 million in engineering and administration cost for a total estimated cost of $43.2 million. Annual operations and maintenance costs are estimated at $2.2 million. In addition, microfiltration would be required at the EDHWWTP to remove algae from the equalization pond. This cost is detailed under section 6.3.1. This is larger than the estimated cost for Phase III expansion. As such, this option has the potential to more than triple the cost of the phase expansion/upgrades, which would more than triple the costs to ratepayers.

6.3.5 Regionalization

Connecting the El Dorado Hills sewer shed to the Sacramento Regional Water Treatment Plant (SRWTP) could eliminate the need for the EDHWWTP if available capacity at SRWTP could be allocated to El Dorado Hills. This would require cross county collaboration. If feasible, this would have the additional impact of reducing flow in Carson Creek and moving the water quality impacts associated with El Dorado Hills effluent to the Sacramento River where greater dilution flows are present. For bioaccumulative substances of concern in the Delta (e.g. mercury, and Group A organochlorine pesticides), there is not likely to be any decrease in the mass loadings reaching the Delta.

To accommodate the connection, a 20 mile 30-inch gravity pipeline would need to be installed. Considering connection fees[3] and highway and railroad crossing, the construction cost is estimated at $104 million with $20.8 million for engineering and administration cost for a total estimated cost of $125 million. Annual operation and maintenance costs for the pipeline are estimated to be $3.2 million. This is for a total capacity of 4.0 mgd and does not consider potential right of way costs. This cost estimate is more than three times larger than the estimated cost for Phase III expansion and does not address the cost of significant logistic, permitting, and environmental impact analyses that would be required. As such, its implementation would more than triple the capital costs of the planned expansion/upgrades and thus would more than triple the ratepayers cost for this expansion.

6.3.6 Change in Source Water Supply

The District's current water source is surface water from the upper American and Cosumnes River watersheds. The source water quality is very high, with low turbidity, TDS, and little developed industry other than logging. It is not feasible to change water source to match or improve the existing high quality source water.

[3] For connection fees, a 80% residential and 20% commercial/industrial mix was assumed.

6.3.7 Rate Payer Cost Increases

To evaluate alternatives to expanding EDHWWTP's discharge capacity, the District finance department calculated the average annual rate increase per customer in the service area. Financing for the total construction costs was assumed at a fixed rate of 5% for 25 years. The rate increases also assumed a fixed average customer consumption rate and that no other funding sources were available to offset the rate increases. **Table 12** summarizes the alternative costs and corresponding annual rate increase for both new and existing customers.

Table 12. Summary of costs and annual rate increases for alternatives to expanding EDHWWTP discharge capacity.

Alternative	Plan Elements	Total Construction Cost	Operations Cost	Connection Fee Increase	Annual Rate Increase	
					New Customer	Existing Customer
Higher level of treatment	Initial feasibility evaluated with microfiltration	$44,400,000	$2,260,000	$351	$210	$119
Zero discharge	New storage pond, pump, and pipeline to accommodate additional 181 million gallons	$37,200,000	$930,000	$294	$176	$49
Flow-restricted discharge	Necessary flow conditions are too infrequent to provide any significant benefit.					
Pollutant source minimization	Elimination of alum, microfiltration at water and wastewater treatment plants	$87,660,000	$4,460,000	$692	$415	$119
Regionalization	20 mile, 30-inch gravity pipeline	$125,000,000	$3,2000,000	$987	$592	$168
Change in water supply	Not possible to find better quality water source than existing.					

6.4 Benefits of Increased Discharge

El Dorado County has experienced rapid population growth in recent years. According to the County's General Plan, the overall population of the County increased by 24 percent from 1990 to 2000, with the unincorporated part growing 28 percent during the same period. El Dorado County had the eighth highest increase in overall California county population between 1990 and 2000 (El Dorado County 2004). The General Plan identifies over 1,000 acres of vacant land in El Dorado Hills suitable for commercial and residential development. Furthermore, the General Plan requires high-density and multifamily residential, commercial, and industrial projects to connect to public wastewater collection facilities as a condition of approval, with certain exceptions in certain communities. El Dorado Hills currently relies on the District and the EDHWWTP to provide wastewater collection and treatment, as well as recycled wastewater for irrigation purposes.

Given the current infrastructure in place, future development in El Dorado Hills also would rely on the District and the EDHWWTP for wastewater collection, treatment, and recycled water services. The expansion of the EDHWWTP from its current 3.0 mgd ADWF permitted capacity to 4.0 mgd ADWF would accommodate planned and approved growth in El Dorado Hills and surrounding areas. Such growth strengthens the economic status (via tax basis, etc.) of El Dorado Hills and the County, and provides improved community services and retail benefits to residents.

6.5 Environmental Considerations

Without the incremental increase in EDHWWTP discharge, the benefit of a 12.5% flow augmentation, on average during the discharge season, to Carson Creek would be unrealized. Having new development in the region independently treat its wastewater in an effort to eliminate any incremental degradation of water quality in Carson Creek would not be cost-effective, may not reduce loadings to downstream portions of the watershed (e.g., Delta), and may not improve water quality (from a constituent concentration basis) throughout Carson Creek. Moreover, disposal of the new development's wastewater elsewhere would not eliminate the need to meet water quality objectives elsewhere in Carson Creek, in another surface water body, or in ground water.   Installation of advance treatment designed to eliminate all incremental changes in downstream water quality (e.g., reverse osmosis for a significant portion of the plant's flow) would be very costly, and would result in new environmental concerns associated with increased energy use and brine disposal.

6.6 Socioeconomic Considerations

Placing connection bans on the EDHWWTP to prevent increased discharges, thereby eliminating any incremental change to Carson Creek water quality, would have negative socioeconomic effects on the area and would not be in the best interest of the people of the region or the state, in light of the magnitude and effects of incremental changes to water quality in Carson Creek that are expected as a result of plant expansion from 3.0 to 4.0 mgd (ADWF).

Should the incremental changes in Carson Creek water quality characterized herein (which could occur as a result of accommodating planned and approved growth within the EDHWWTP service area) be disallowed, such action would: 1) force future developments in El Dorado Hills to find alternative methods for disposing of wastewater, 2) require adding a reverse-osmosis treatment processes to a significant portion of flow at the EDHWWTP, and possibly other plant expansions/upgrades, to eliminate the increment for all constituents from the additional discharge rate, or 3) prohibit planned and approved development within and adjacent to the EDHWWTP service area.

The EDHWWTP currently maximizes production and use of recycled water, and will continue to do so in the future, thereby minimizing discharges to surface waters. The District will continue to operate a treatment train that meets BPTC. Any potential for discharges to cause exceedances of adopted water quality criteria/objectives would be effectively addressed through the NPDES permit renewal process, thereby being addressed in a timely manner. Thus, resulting downstream water quality within Carson Creek would not cause a nuisance and would continue to be protective of all beneficial uses under the proposed expansion to 4.0 mgd (ADWF).

7 ANTIDEGRADATION ANALYSIS FINDINGS

The following is a summary of the key findings of this report.

1. **The water quality parameters and beneficial uses which will be affected by the proposed action and the extent of the impact.**

   Section 3.1 details the beneficial uses of Carson Creek. The extent of water quality impacts from the proposed plant expansion are assessed in Section 4.5, through tables and discussion, and summarized below.

   The extent of impacts from EDHWWTP's proposed increased discharge capacity were primarily assessed on the basis of assimilative capacity utilization – on a mass balance approach for all constituents and, additionally for bioaccumulative constituents, on a mass loading basis. The increased discharge would augment the average discharge rate, during the discharge season, by 12.5%.

   The water quality of Carson Creek, with respect to chemical constituents, pH, and turbidity would remain better than necessary to support beneficial uses. Where there is reasonable potential to exceed standards, effluent limitations have been proposed that would ensure against such exceedances. Better than necessary water quality is also expected to be the case for temperature and DO; however, further assessment of these parameters may be warranted.

   The incremental increase in discharge would lower water quality in Carson Creek, relative to that which would occur under the current permitted capacity for the EDHWWTP. The incremental increase in discharge could result in greatest incremental effects on water quality alpha-endosulfsan, endrin aldehyde, and gamma-BHC. However, all these constituents have proposed effluent limitations which would reduce effluent concentrations, resulting in a net improvement in Carson Creek water quality.

   The incremental increase in discharge could also lead to increased mass loading of bioaccumulative constituents such as mercury and several persistent chlorinated pesticides. Nevertheless, the revised permit will contain effluent limits for these constituents and the additional loading to Carson Creek would not adversely affect existing or anticipated future beneficial uses of the creek or downstream waterbodies. In short, no beneficial uses of Carson Creek or downstream waters are anticipated to be adversely affected by the planned expansion.

2. **The scientific rationale for determining that the proposed action will or will not lower water quality.**

   Sections 4.1 through 4.4 detail the scientific rationale for determining if lowering of water quality occurs. This rationale is based on federal (Section 2.1.1) and state (Section 2.2.3) guidance and tracks the use of assimilative capacity to link changes in water quality to the beneficial uses to be protected.

   Generally the relevant water quality standards are concentration-based in order to prevent exceedances of concentration-based exposure thresholds. Critical flows and representative water quality measurements were criteria-dependent (i.e. shorter representative averaging periods for acute effects as compare to long-term human health criteria).

   The nature of downstream water bodies may facilitate extended residence time or deposition of contaminants. Therefore, for bioaccumulative constituents, mass loadings were also considered in assessing potential lowering of water quality from increased EDHWWTP discharge.

   Incremental change in water quality that would occur in Carson Creek due to an increase in the EDHWWTP discharge rate from 3.0 mgd ADWF, the current permitted discharge rate, to 4.0 mgd ADWF were identified.

3. **A description of the alternative control measures that were considered.**

   Several alternatives were considered that would reduce or eliminate the lowering of water quality resulting from the additional 1 mgd of discharge capacity proposed with the plant expansion. These plant expansion alternatives are listed below are described in detail in Section 6.2.

   - Higher level of treatment using microfiltration.
   - Zero discharge (100%) recycling of additional plant capacity;
   - Flow restricted discharge;
   - Pollutant source minimization;
   - Connect to Sacramento Regional Wastewater Treatment Plant; and
   - Change in drinking water source.

4. **A description of the socioeconomic evaluation.**

   To assess potential lowering of Carson Creek water quality, a mass balance, and where appropriate, a mass loading assessment of the use of available assimilative capacity was made. Table 11 summarizes the constituents that exceeded the 10% significance threshold or, for other reasons, triggered a detailed socioeconomic analysis and consideration of alternatives to the potential water quality impacts. The objective of the socioeconomic analysis is to determine if the lowering of Carson Creek water quality is in the “best interest” of the people of the State.

The socioeconomic evaluation considered:

- The social benefits and costs based on the ability to accommodate socioeconomic development in the El Dorado County General Plan.

- Finding: Given the current infrastructure in place, future development in El Dorado Hills also would rely on the District and the EDHWWTP for wastewater collection, treatment, and recycled water services. The expansion of the EDHWWTP from its current 3.0 mgd ADWF permitted capacity to 4.0 mgd ADWF would accommodate planned and approved growth in El Dorado Hills and surrounding areas. Placing connection bans on the EDHWWTP to prevent increased discharges, thereby eliminating any incremental change to Carson Creek water quality, would have negative socioeconomic effects on the area. Should the incremental changes in Carson Creek water quality characterized herein be disallowed, such action would: 1) force future developments in El Dorado Hills to find alternative methods for disposing of wastewater, 2) require adding a reverse-osmosis treatment processes to a significant portion of flow at the EDHWWTP, and possibly other plant expansions/upgrades, to eliminate the increment for all constituents from the additional discharge rate, or 3) prohibit planned and approved development within and adjacent to the EDHWWTP service area.

- The magnitude of the water quality impacts, the change in water quality from existing conditions, and expected effects on beneficial uses of Carson Creek and downstream waters.

  Finding: All the constituents triggering a detailed antidegradation analysis have already been shown by CVRWQCB to have reasonable potential to cause or contribute to exceedances of applicable water quality standards. Therefore, effluent limitations will be applied that will further reduce the potential water quality impacts to Carson Creek, assure water quality criteria/objectives are met, and protect beneficial uses. With the higher 4.0 mgd discharge rate, the remaining constituents would have either an improvement (i.e., lowered creek concentration) or little to no change in creek concentrations or mass loading downstream of the discharge.

- The feasibility and effectiveness of reducing the lowering of water quality by implementing alternatives to lowering of Carson Creek water quality.

  Finding: An evaluation of several alternatives, and their effects on water quality impacts and beneficial use protection, did not identify any feasible alternative control measure that more effectively would accommodate the planned growth that would result from implementing the alternative, relative to implementing the planned expansion. For example, regionalizing the entire discharge is the most effective alternative to prevent lowering of water quality in Carson Creek, but it comes with the greatest cost. Regionalization of the entire discharge would remove nearly half the average winter flow in the Creek, move water quality impacts to the

Sacramento River, and cost more than three times the estimated cost of the proposed increased discharge project.

- The economic costs for alternatives: assessed against the current project expansion cost estimate of $35.6 million; the increased cost for ratepayers; and the magnitude of the change in ratepayer costs.

  Finding: In general, the cost to implement alternatives would be distributed to ratepayers based on need to address existing versus expansion-related water quality issues. New development that requires plant expansion would shoulder costs associated with additional treatment, thereby possibly prohibiting some of the socioeconomic growth for the area by making it economically impractical for the new development to occur. The additional costs for implementing alternatives ranged from one to over three times the estimated costs for the proposed expansion of discharge capacity. For the four viable alternatives, the annual rate increase for existing customers ranged from $49 to $168 as compared to the proposed project. For new customers the annual rate increase ranged from $176 to $592 plus a one time connection fee increase of $294 to $987.

5. The rationale for determining that the proposed action is or is not justified by socioeconomic considerations.

The expansion of the EDHWWTP from its current 3.0 mgd ADWF permitted capacity to 4.0 mgd ADWF would accommodate planned and approved growth in El Dorado Hills and neighboring areas. Having new development in the region independently treat its wastewater in an effort to eliminate any incremental degradation of water quality in Carson Creek would not be cost-effective, may not reduce loadings to downstream portions of the watershed (e.g., Delta), and may not improve water quality (from a constituent concentration basis) throughout Carson Creek. Moreover, disposal of the new development's wastewater elsewhere may simply cause similar and possibly new forms of degradation elsewhere in Carson Creek, in another surface water body, or in ground water.

The EDHWWTP currently maximizes production and use of recycled water, and will continue to do so in the future, thereby minimizing discharges to surface waters. The District will continue to operate a treatment train that meets and exceeds BPTC. Any potential for discharges to cause exceedances of adopted water quality criteria/objectives would be effectively addressed through the NPDES permit renewal process, thereby being addressed in a timely manner. Thus, resulting downstream water quality within Carson Creek would not cause a nuisance and would continue to be protective of all beneficial uses within the creek, as well as uses of downstream waters.

Section 6.2 considered several alternatives and found them infeasible for cost or logistic concerns, when compared to the proposed action of increased EDHWWTP discharge. Installation of advanced treatment designed to eliminate all incremental changes in downstream water quality would be very costly, and would result in new environmental concerns associated with increased energy use and brine disposal. Placing connection bans on the EDHWWTP to prevent degradation of water quality would have direct adverse socioeconomic effects with regard to planned and approved growth in the region, which, in turn, would adversely affect the County's future tax base.

Based on the assessment contained herein, it is determined that the EDHWWTP currently operates, and will operate in the future, to meet the highest statutory and regulatory NPDES requirements which result in the best practicable treatment and control of the discharge necessary to assure that a water quality nuisance will not occur and that beneficial uses are fully protected. The limited degradation in receiving water quality that occur as a result of planned discharge expansion would accommodate important socioeconomic development in the service area while maintaining full protection of the creek's beneficial uses. An evaluation of several alternatives, and their effects on water quality impacts and beneficial use protection, did not identify any feasible alternative control measure that more effectively would accommodate the planned growth that would result from implementing the alternative, relative to implementing the planned expansion.

Based on the analysis contained herein, the anticipated water quality changes in Carson Creek will be consistent with state and federal antidegradation policies, will be to the socioeconomic benefit to the people of the region, be to the maximum benefit of the people of the State, and will not result in water quality less than that prescribed in the policies, that required to prevent a nuisance, or that required to protect beneficial uses.

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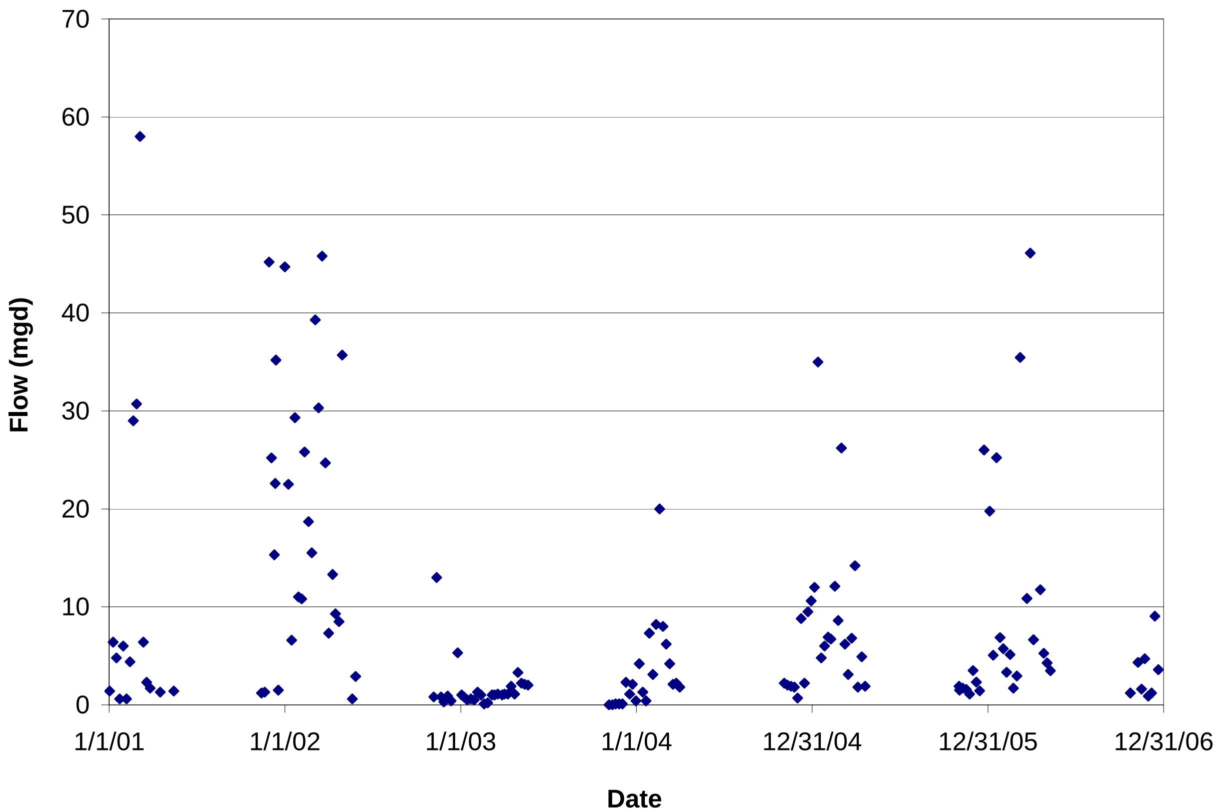
Appendix A

Carson Creek Flow Rates

Carson Creek Flow (million gallons per day) from January 1, 2001 through December 27, 2006 [a]

	Jan	Feb	Mar	Apr	May	Nov	Dec
Count	27	24	27	17	8	25	26
Average	9.8	9.5	17.2	6.8	2.4	3.7	14.9
Median	6.0	6.8	6.2	4.9	2.2	1.6	2.9
Minimum	0.4	0.1	1.0	1.1	0.6	0.0	0.1
Maximum	44.7	30.7	83.2	35.7	4.3	45.2	100

[a] Data collected weekly during periods of discharge to the creek from the El Dorado Hills Wastewater Treatment Plant upstream of the outfall at the R1 monitoring location.



Appendix B

Effluent Quality Summary Statistics

Appendix B

El Dorado Hills Wastewater Treatment Plant Effluent Quality Summary Statistics

Constituent	Units	Begin Date	End Date	Number of Samples	Number Detected Above Reporting Limit	Percent Detected	Minimum Concentration[a]	Average Concentration[b]	Maximum Concentration[a]	Minimum Reporting Limit	Maximum Reporting Limit
1,1,1-Trichloroethane	ug/l	3/28/2001	5/1/2006	23	0	0%		0.608695652		0.5	2
1,1,2,2-Tetrachloroethane	ug/l	3/28/2001	5/1/2006	23	0	0%		0.25		0.5	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	ug/l	3/28/2001	4/21/2005	20	0	0%		2.8625		0.5	10
1,1,2-Trichloroethane	ug/l	3/28/2001	5/1/2006	23	0	0%		0.25		0.5	0.5
1,1-Dichloroethane	ug/l	3/28/2001	5/1/2006	23	0	0%		0.391304348		0.5	1
1,1-Dichloroethene	ug/l	3/28/2001	5/1/2006	23	0	0%		0.25		0.5	0.5
1,2,4-Trichlorobenzene	ug/l	3/28/2001	5/1/2006	18	0	0%		1.830555556		0.1	5
1,2-Dichlorobenzene	ug/l	3/28/2001	5/1/2006	27	0	0%		0.525925926		0.1	2
1,2-Dichloroethane	ug/l	3/28/2001	5/1/2006	23	0	0%		0.25		0.5	0.5
1,2-Dichloropropane	ug/l	3/28/2001	5/1/2006	23	0	0%		0.25		0.5	0.5
1,2-Diphenylhydrazine	ug/l	3/28/2001	5/1/2006	15	0	0%		0.36		0.2	1
1,2-Trans-dichloroethylene	ug/l	3/28/2001	5/1/2006	23	0	0%		0.391304348		0.5	1
1,3-Dichlorobenzene	ug/l	3/28/2001	5/1/2006	27	1	4%	0.071	0.526703704	0.071	0.1	2
1,3-Dichloropropene	ug/l	3/28/2001	5/1/2006	23	0	0%		0.25		0.5	0.5
1,4-Dichlorobenzene	ug/l	3/28/2001	5/1/2006	27	3	11%	0.022	0.524666667	0.069	0.1	2
2,4,5-TP (Silvex)	ug/l	3/29/2001	4/21/2005	12	0	0%		0.775		0.2	10
2,4,6-Trichlorophenol	ug/l	3/28/2001	5/1/2006	15	0	0%		3.346666667		0.1	10
2,4-D	ug/l	3/29/2001	3/23/2006	14	0	0%		6.607142857		1	100
2,4-Dichlorophenol	ug/l	3/28/2001	5/1/2006	15	2	13%	0.1	0.714666667	0.52	0.1	2
2,4-Dimethylphenol	ug/l	3/28/2001	5/1/2006	15	0	0%		0.933333333		1	3
2,4-Dinitrophenol	ug/l	3/28/2001	5/1/2006	15	0	0%		1.733333333		0.5	5
2,4-Dinitrotoluene	ug/l	3/28/2001	5/1/2006	15	0	0%		1.68		0.1	5
2,6-Dinitrotoluene	ug/l	3/28/2001	5/1/2006	15	0	0%		1.68		0.1	5
2-Chloroethyl vinyl ether	ug/l	3/28/2001	3/23/2006	22	0	0%		0.397727273		0.5	1
2-Chloronaphthalene	ug/l	3/28/2001	5/1/2006	15	0	0%		3.346666667		0.1	10
2-Chlorophenol	ug/l	3/28/2001	5/1/2006	15	1	7%	0.061	0.690733333	0.061	0.2	2
2-Methyl-4,6-Dinitrophenol	ug/l	3/28/2001	5/1/2006	15	0	0%		3.4		0.5	10
2-Nitrophenol	ug/l	3/28/2001	5/1/2006	15	1	7%	0.1	3.36	0.1	0.2	10
3,3'-Dichlorobenzidine	ug/l	3/28/2001	5/1/2006	15	0	0%		1.693333333		0.2	5
3-Methyl-4-Chlorophenol	ug/l	3/28/2001	5/1/2006	15	1	7%	0.047	1.6798	0.047	0.1	5
4,4'-DDD	ug/l	3/28/2001	5/1/2006	15	0	0%		0.019666667		0.01	0.05
4,4'-DDE	ug/l	3/28/2001	5/1/2006	15	0	0%		0.019666667		0.01	0.05
4,4'-DDT	ug/l	3/28/2001	5/1/2006	15	1	7%	0.047	0.0088	0.047	0.01	0.02
4-Bromophenyl phenyl ether	ug/l	3/28/2001	5/1/2006	15	0	0%		3.346666667		0.1	10
4-Chlorophenyl phenyl ether	ug/l	3/28/2001	5/1/2006	15	0	0%		1.68		0.1	5
4-Nitrophenol	ug/l	3/28/2001	5/1/2006	15	1	7%	0.49	3.416	0.49	0.5	10
Acenaphthene	ug/l	3/28/2001	5/1/2006	15	0	0%		0.196666667		0.1	0.5
Acenaphthylene	ug/l	3/28/2001	5/1/2006	15	0	0%		0.086666667		0.1	0.2
Acrolein	ug/l	3/28/2001	5/1/2006	23	0	0%		3.847826087		2	30
Acrylonitrile	ug/l	3/28/2001	5/1/2006	23	0	0%		3		2	30
Alachlor	ug/l	10/24/2001	2/14/2002	4	0	0%		0.5		1	1

Appendix B

El Dorado Hills Wastewater Treatment Plant Effluent Quality Summary Statistics

Constituent	Units	Begin Date	End Date	Number of Samples	Number Detected Above Reporting Limit	Percent Detected	Minimum Concentration[a]	Average Concentration[b]	Maximum Concentration[a]	Minimum Reporting Limit	Maximum Reporting Limit
Aldrin	ug/l	3/28/2001	5/1/2006	15	1	7%	0.016	0.003733333	0.016	0.005	0.01
alpha-BHC	ug/l	3/28/2001	5/1/2006	15	2	13%	0.0084	0.00576	0.013	0.01	0.01
alpha-Endosulfan	ug/l	3/28/2001	5/1/2006	15	3	20%	0.0096	0.012	0.053	0.01	0.02
Aluminum (Dissolved)	ug/l	3/27/2001	11/8/2005	18	17	94%	9.4	114	466	0.1	50
Aluminum (Total)	ug/l	3/27/2001	5/1/2006	21	19	90%	18.9	161	760	0.1	50
Ammonia	mg/l	11/3/2004	12/27/2006	67	1	1%	3.4	0.543283582	3.4	1	1
Anthracene	ug/l	3/28/2001	5/1/2006	15	0	0%		0.086666667		0.1	0.2
Antimony (Dissolved)	ug/l	3/27/2001	11/8/2005	18	14	78%	0.186	1.1	4.6	0.001	5
Antimony (Total)	ug/l	3/27/2001	5/1/2006	23	14	61%	0.201	1.3	2.1	0.001	5
Aroclor 1016	ug/l	3/28/2001	5/1/2006	15	0	0%		0.21		0.2	0.5
Aroclor 1221	ug/l	3/28/2001	5/1/2006	15	0	0%		0.21		0.2	0.5
Aroclor 1232	ug/l	3/28/2001	5/1/2006	15	0	0%		0.21		0.2	0.5
Aroclor 1242	ug/l	3/28/2001	5/1/2006	15	0	0%		0.21		0.2	0.5
Aroclor 1248	ug/l	3/28/2001	5/1/2006	15	0	0%		0.21		0.2	0.5
Aroclor 1254	ug/l	3/28/2001	5/1/2006	15	0	0%		0.21		0.2	0.5
Aroclor 1260	ug/l	3/28/2001	5/1/2006	15	0	0%		0.21		0.2	0.5
Arsenic (Dissolved)	ug/l	3/27/2001	11/8/2005	18	15	83%	0.241	0.66	1.9	0.002	1
Arsenic (Total)	ug/l	3/27/2001	5/1/2006	23	18	78%	0.245	0.70	1.9	0.002	1
Asbestos	mf/l	3/28/2001	3/23/2006	21	0	0%		0.128333333		0.19	1.13
Atrazine	ug/l	3/29/2001	1/23/2002	4	0	0%		0.5		1	1
Barium (Dissolved)	ug/l	3/27/2001	4/21/2005	17	16	94%	1.33	5.0	5.1	0.001	100
Barium (Total)	ug/l	3/27/2001	4/21/2005	18	17	94%	1.3	5.1	6.5	0.001	100
Bentazon	ug/l	3/29/2001	4/21/2005	12	0	0%		1.5125		0.1	20
Benzene	ug/l	3/28/2001	5/1/2006	23	0	0%		0.210869565		0.3	0.5
Benzidine	ug/l	3/28/2001	5/1/2006	15	0	0%		1.8		1	5
Benzo (a) anthracene	ug/l	3/28/2001	5/1/2006	15	0	0%		0.086666667		0.1	0.2
Benzo (a) pyrene	ug/l	3/28/2001	5/1/2006	15	0	0%		0.063333333		0.1	0.2
Benzo (b) fluoranthene	ug/l	3/28/2001	5/1/2006	15	0	0%		0.196666667		0.1	0.5
Benzo (g,h,i) perylene	ug/l	3/28/2001	5/1/2006	15	0	0%		0.1		0.2	0.2
Benzo (k) fluoranthene	ug/l	3/28/2001	5/1/2006	15	0	0%		0.086666667		0.1	0.2
Beryllium (Dissolved)	ug/l	3/27/2001	11/8/2005	18	1	6%	0.008	0.169527778	0.008	0.003	1
Beryllium (Total)	ug/l	3/27/2001	5/1/2006	23	3	13%	0.003	0.245934783	0.62	0.003	1
beta-BHC	ug/l	3/28/2001	5/1/2006	15	1	7%	0.018	0.003866667	0.018	0.005	0.01
beta-Endosulfan	ug/l	3/28/2001	5/1/2006	15	2	13%	0.0088	0.009453333	0.068	0.01	0.01
Bis (2-chloroethoxy) methane	ug/l	3/28/2001	5/1/2006	15	0	0%		1.8		1	5
Bis (2-chloroethyl) ether	ug/l	3/28/2001	5/1/2006	15	1	7%	3.2	0.646666667	3.2	0.5	1
Bis (2-chloroisopropyl) ether	ug/l	3/28/2001	5/1/2006	15	1	7%	0.071	3.358066667	0.071	0.2	10
Bis (2-ethylhexyl) phthalate	ug/l	3/28/2001	5/1/2006	15	1	7%	2.6	1.94	2.6	2	5
BOD	mg/l	1/1/2001	12/31/2006	1054	891	85%	2	3.0	34	2	3
Bromodichloromethane	ug/l	3/28/2001	5/1/2006	23	23	100%	5.4	11	18	0.5	0.5
Bromoform	ug/l	3/28/2001	5/1/2006	23	0	0%		0.608695652		0.5	2

Appendix B

El Dorado Hills Wastewater Treatment Plant Effluent Quality Summary Statistics

Constituent	Units	Begin Date	End Date	Number of Samples	Number Detected Above Reporting Limit	Percent Detected	Minimum Concentration[a]	Average Concentration[b]	Maximum Concentration[a]	Minimum Reporting Limit	Maximum Reporting Limit
Butyl benzyl phthalate	ug/l	3/28/2001	5/1/2006	15	0	0%		3.346666667		0.1	10
Cadmium (Dissolved)	ug/l	3/27/2001	11/8/2005	18	12	67%	0.028	0.145	0.121	0.001	1.25
Cadmium (Total)	ug/l	3/27/2001	5/1/2006	23	15	65%	0.03	0.093	0.121	0.001	0.25
Carbofuran	ug/l	3/29/2001	1/28/2002	4	0	0%		1.3		0.2	5
Carbon Tetrachloride	ug/l	3/28/2001	5/1/2006	23	1	4%	0.42	0.257391304	0.42	0.5	0.5
Chlordane	ug/l	3/28/2001	5/1/2006	15	1	7%	0.0099	0.038326667	0.0099	0.01	0.1
Chloride	mg/l	3/29/2001	5/22/2002	13	13	100%	57	67	84	5	10
Chlorobenzene	ug/l	3/28/2001	5/1/2006	23	0	0%		0.673913043		0.5	2
Chloroethane	ug/l	3/28/2001	5/1/2006	23	2	9%	0.18	0.675217391	0.35	0.5	2
Chloroform	ug/l	3/28/2001	5/1/2006	23	23	100%	17	62	120	0.5	5
Chlorpyrifos	ug/l	3/29/2001	1/23/2002	5	0	0%		0.215		0.05	1
Chromium (Dissolved)	ug/l	3/27/2001	11/8/2005	18	12	67%	0.14	0.424444444	1.1	0.02	2
Chromium (Total)	ug/l	3/27/2001	5/1/2006	23	15	65%	0.09	0.48	0.91	0.02	2
Chromium (VI)	ug/l	11/6/2002	5/1/2006	11	0	0%		0.5		1	1
Chrysene	ug/l	3/28/2001	5/1/2006	15	0	0%		0.086666667		0.1	0.2
cis-1,2-Dichloroethene	ug/l	3/28/2001	2/13/2002	12	0	0%		0.25		0.5	0.5
COLIFORM, TOTAL	MPN/100 ml	1/1/2001	12/31/2006	1069	96	9%	2	4.424976614	1600	2	8
Copper (Dissolved)	ug/l	3/27/2001	11/8/2005	18	18	100%	3.8	11.0	19.1	0.01	0.5
Copper (Total)	ug/l	3/27/2001	5/1/2006	23	23	100%	4.4	11.5	19.5	0.01	0.5
Cyanide	ug/l	3/29/2001	5/1/2006	23	3	13%	2.6	2.869565217	6.7	5	5
Dalapon	ug/l	3/29/2001	4/21/2005	12	1	8%	7.4	7.616666667	7.4	2	100
delta-BHC	ug/l	3/28/2001	5/1/2006	15	1	7%	0.0027	0.002846667	0.0027	0.005	0.01
Di(2-ethylhexyl)adipate	ug/l	3/29/2001	1/23/2002	4	0	0%		2.5		5	5
Diazinon	ug/l	3/29/2001	2/14/2002	6	0	0%		0.091666667		0.05	0.25
Dibenzo (a,h) anthracene	ug/l	3/28/2001	5/1/2006	15	0	0%		0.063333333		0.1	0.2
Dibromochloromethane	ug/l	3/28/2001	5/1/2006	23	21	91%	0.43	1.2	3.1	0.5	0.5
Dibromochloropropane	ug/l	3/28/2001	5/22/2002	13	0	0%		3.078461538		0.01	10
Dieldrin	ug/l	3/28/2001	5/1/2006	15	0	0%		0.005		0.01	0.01
Diethyl phthalate	ug/l	3/28/2001	5/1/2006	15	2	13%	0.26	0.733333333	0.44	0.3	2
Dimethyl phthalate	ug/l	3/28/2001	5/1/2006	15	2	13%	0.062	0.681866667	0.066	0.1	2
Di-n-butyl phthalate	ug/l	3/28/2001	5/1/2006	15	1	7%	0.74	3.422666667	0.74	0.4	10
Di-n-octyl phthalate	ug/l	3/28/2001	5/1/2006	15	0	0%		3.36		0.2	10
Dinoseb	ug/l	3/29/2001	4/21/2005	12	0	0%		1.541666667		1	20
Diquat	ug/l	3/29/2001	1/24/2002	4	0	0%		2		4	4
Endosulfan sulfate	ug/l	3/28/2001	5/1/2006	15	0	0%		0.019666667		0.01	0.05
Endothall	ug/l	3/29/2001	1/24/2002	4	0	0%		22.5		45	45
Endrin	ug/l	3/28/2001	5/1/2006	15	1	7%	0.017	0.0058	0.017	0.01	0.01
Endrin Aldehyde	ug/l	3/28/2001	5/1/2006	15	3	20%	0.018	0.027866667	0.17	0.01	0.01
Ethylbenzene	ug/l	3/28/2001	5/1/2006	23	3	13%	0.2	0.663478261	0.65	0.3	2
Ethylene dibromide	ug/l	3/28/2001	5/22/2002	13	0	0%		1.733846154		0.02	5
Fluoranthene	ug/l	3/28/2001	5/1/2006	15	0	0%		0.086666667		0.1	0.2

Appendix B

El Dorado Hills Wastewater Treatment Plant Effluent Quality Summary Statistics

Constituent	Units	Begin Date	End Date	Number of Samples	Number Detected Above Reporting Limit	Percent Detected	Minimum Concentration[a]	Average Concentration[b]	Maximum Concentration[a]	Minimum Reporting Limit	Maximum Reporting Limit
Fluorene	ug/l	3/28/2001	5/1/2006	15	0	0%		0.086666667		0.1	0.2
Fluoride	mg/l	3/29/2001	5/22/2002	13	8	62%	0.038	0.073	0.2	0.1	0.5
gamma BHC	ug/l	3/28/2001	5/1/2006	15	4	27%	0.011	0.0172	0.067	0.01	0.02
Glyphosate	ug/l	3/29/2001	1/23/2002	4	0	0%		12.5		25	25
Hardness (as CaCO3)	mg/l	3/28/2001	5/8/2003	16	16	100%	52	67	82	1	1
Heptachlor	ug/l	3/28/2001	5/1/2006	15	2	13%	0.0036	0.009773333	0.078	0.01	0.01
Heptachlor epoxide	ug/l	3/28/2001	5/1/2006	15	0	0%		0.0044		0.001	0.01
Hexachlorobenzene	ug/l	3/28/2001	5/1/2006	15	0	0%		0.346666667		0.1	1
Hexachlorobutadiene	ug/l	3/28/2001	5/1/2006	16	0	0%		0.4		0.2	1
Hexachlorocyclopentadiene	ug/l	3/28/2001	5/1/2006	15	0	0%		1.693333333		0.2	5
Hexachloroethane	ug/l	3/28/2001	5/1/2006	15	0	0%		0.693333333		0.2	2
Indeno (1,2,3-c,d) pyrene	ug/l	3/28/2001	5/1/2006	15	0	0%		0.045		0.05	0.2
Iron (Dissolved)	ug/l	3/27/2001	4/21/2005	17	13	76%	1.1	12	24	0.1	100
Iron (Total)	ug/l	3/27/2001	4/21/2005	18	12	67%	5.1	19	28	0.1	100
Isophorone	ug/l	3/28/2001	5/1/2006	15	1	7%	0.12	0.391333333	0.12	0.5	1
Lead (Dissolved)	ug/l	3/27/2001	11/8/2005	18	14	78%	0.03	0.17	0.91	0.002	0.5
Lead (Total)	ug/l	3/27/2001	5/1/2006	23	13	57%	0.041	0.17	0.64	0.002	0.5
Manganese (Dissolved)	ug/l	3/27/2001	4/21/2005	17	13	76%	0.54	5.6	38	0.01	20
Manganese (Total)	ug/l	3/27/2001	4/21/2005	18	15	83%	0.71	6.4	40	0.01	20
MBAS	mg/l	3/28/2001	5/22/2002	12	12	100%	0.11	0.23	0.39	0.1	0.5
Mercury (Dissolved)	ug/l	3/27/2001	11/8/2005	18	17	94%	0.00062	0.15576	2.78000	0.0001	0.5
Mercury (Total)	ug/l	3/27/2001	5/1/2006	22	21	95%	0.00039	0.39790	3.10000	0.0001	0.5
Methoxychlor	ug/l	3/28/2001	1/22/2002	4	0	0%		0.025		0.05	0.05
Methyl bromide	ug/l	3/28/2001	5/1/2006	23	3	13%	0.84	0.827826087	3.7	0.5	2
Methyl chloride	ug/l	3/28/2001	5/1/2006	23	0	0%		0.608695652		0.5	2
Methylene chloride	ug/l	3/28/2001	5/1/2006	23	3	13%	0.15	0.665217391	0.21	0.5	2
Methyl-tert-butyl ether (MTBE)	ug/l	3/28/2001	4/21/2005	20	1	5%	2.5	2	2.5	3	5
Molinate	ug/l	3/29/2001	2/14/2002	6	0	0%		1		2	2
Naphthalene	ug/l	3/28/2001	5/1/2006	16	0	0%		0.39375		0.1	10
Nickel (Dissolved)	ug/l	3/27/2001	11/8/2005	18	18	100%	0.76	3.4	9.82	0.01	5
Nickel (Total)	ug/l	3/27/2001	5/1/2006	23	21	91%	1.63	3.5	9.43	0.01	5
Nitrate (as N)	mg/l	11/1/2004	12/27/2006	390	390	100%	3.4	5.8	11		
Nitrite (as N)	mg/l	3/29/2001	5/22/2002	13	3	23%	0.037	0.078	0.29	0.12	0.15
Nitrobenzene	ug/l	3/28/2001	5/1/2006	15	1	7%	0.3	3.403333333	0.3	0.5	10
N-Nitrosodimethylamine	ug/l	3/28/2001	5/1/2006	15	0	0%		1.8		1	5
N-Nitroso-di-n-propylamine	ug/l	3/28/2001	5/1/2006	15	0	0%		1.8		1	5
N-Nitrosodiphenylamine	ug/l	3/28/2001	5/1/2006	15	0	0%		0.36		0.2	1
Oxamyl	ug/l	3/29/2001	1/28/2002	4	0	0%		5.025		0.1	20
Pentachlorophenol	ug/l	3/28/2001	5/1/2006	16	0	0%		0.71875		0.5	10
pH	std units	1/1/2001	11/1/2007	1070	1070	100%	6.2	7.108598131	8		
Phenanthrene	ug/l	3/28/2001	5/1/2006	15	1	7%	0.02	0.084666667	0.02	0.1	0.2

Appendix B

El Dorado Hills Wastewater Treatment Plant Effluent Quality Summary Statistics

Constituent	Units	Begin Date	End Date	Number of Samples	Number Detected Above Reporting Limit	Percent Detected	Minimum Concentration[a]	Average Concentration[b]	Maximum Concentration[a]	Minimum Reporting Limit	Maximum Reporting Limit
Phenol	ug/l	3/28/2001	5/1/2006	15	1	7%	0.49	0.396	0.49	0.3	1
Phosphorus (Total)	mg/l	3/28/2001	2/14/2002	13	13	100%	0.9	2.0	3	0.1	1
Picloram	ug/l	3/29/2001	4/21/2005	12	0	0%		0.875		1	10
Pyrene	ug/l	3/28/2001	5/1/2006	15	0	0%		0.086666667		0.1	0.2
Selenium (Dissolved)	ug/l	3/27/2001	11/8/2005	18	13	72%	0.117	1.00	1.9	0.008	5
Selenium (Total)	ug/l	3/27/2001	5/1/2006	23	15	65%	0.112	1.4	3.7	0.008	5
Silver (Dissolved)	ug/l	3/27/2001	11/8/2005	18	7	39%	0.003	0.170	0.009	0.001	1
Silver (Total)	ug/l	3/27/2001	5/1/2006	23	6	26%	0.003	0.242	0.008	0.001	1
Simazine	ug/l	3/29/2001	2/14/2002	6	0	0%		0.75		1	4
Specific conductance	umhos/cm	1/16/2001	12/27/2006	165	165	100%	510	719	940	1	1
Styrene	ug/l	3/28/2001	4/21/2005	20	0	0%		1.2625		0.5	5
Sulfate (as SO4)	mg/l	3/29/2001	5/22/2002	13	13	100%	33	56	72	0.5	10
Sulfide	mg/l	3/28/2001	2/14/2002	12	5	42%	0.6	1.8	6.6	1	1
Sulfite	mg/l	3/28/2001	2/14/2002	12	11	92%	2.8	6.7	15	2	5
TDS (Total dissolved solids)	mg/l	3/28/2001	5/22/2002	14	14	100%	390	480	590	1	10
Temperature	F	1/1/2001	12/31/2006	1068	1068	100%	46.9	59.2	78.3		
Tetrachloroethylene	ug/l	3/28/2001	5/1/2006	23	0	0%		0.25		0.5	0.5
Thallium (Dissolved)	ug/l	3/27/2001	11/8/2005	18	10	56%	0.001	0.169	0.011	0.001	1
Thallium (Total)	ug/l	3/27/2001	5/1/2006	23	11	48%	0.001	0.226	0.13	0.001	1
Thiobencarb	ug/l	3/29/2001	2/14/2002	6	0	0%		0.5		1	1
Toluene	ug/l	3/28/2001	5/1/2006	23	7	30%	0.11	0.63	0.92	0.3	2
Toxaphene	ug/l	3/28/2001	5/1/2006	15	0	0%		0.21		0.2	0.5
Tributyltin	ug/l	3/27/2001	12/19/2002	12	4	33%	0.006	0.004	0.018	0.002	0.01
Trichloroethylene	ug/l	3/28/2001	5/1/2006	23	0	0%		0.673913043		0.5	2
Trichlorofluoromethane	ug/l	3/28/2001	4/21/2005	20	0	0%		1.4875		0.5	5
Turbidity	NTU	1/1/2002	12/31/2006	910	910	100%	0.025	0.35	4.09		
Vinyl Chloride	ug/l	3/28/2001	5/1/2006	23	0	0%		0.25		0.5	0.5
Xylenes	ug/l	3/28/2001	2/13/2002	12	3	25%	0.54	0.46	2	0.5	0.5
Zinc (Dissolved)	ug/l	3/27/2001	11/8/2005	18	18	100%	4.8	25	51	0.02	10
Zinc (Total)	ug/l	3/27/2001	5/1/2006	23	23	100%	17.8	43	330	0.02	10

Notes:

[a] Concentrations reported include estimated concentrations between the method detection limit and laboratory reporting limit; hence concentrations may be lower than the reporting limit range specified.

[b] One-half of the reporting limit for "non-detect" samples is used to calculate the average. Hence the average could fall outside of the range of minimum and maximum concentrations reported.

Appendix C

Carson Creek Water Quality Summary Statistics

Appendix C

Carson Creek Water Quality Summary Statistics for the Upstream (R1) Monitoring Station

Constituent	Units	Begin Date	End Date	Number of Samples	Number Detected Above Reporting Limit	Percent Detected	Minimum Concentration[a]	Average Concentration[b]	Maximum Concentration[a]	Minimum Reporting Limit	Maximum Reporting Limit
1,1,1-Trichloroethane	ug/l	3/28/2001	1/24/2002	4	0	0%		0.25		0.5	0.5
1,1,2,2-Tetrachloroethane	ug/l	3/28/2001	1/24/2002	4	0	0%		0.25		0.5	0.5
1,1,2-Trichloro-1,2,2-trifluoroethane	ug/l	3/28/2001	1/24/2002	4	0	0%		1.4375		0.5	10
1,1,2-Trichloroethane	ug/l	3/28/2001	1/24/2002	4	0	0%		0.25		0.5	0.5
1,1-Dichloroethane	ug/l	3/28/2001	1/24/2002	4	0	0%		0.3125		0.5	1
1,1-Dichloroethene	ug/l	3/28/2001	1/24/2002	4	0	0%		0.25		0.5	0.5
1,2,4-Trichlorobenzene	ug/l	3/28/2001	1/24/2002	5	0	0%		0.54		0.1	5
1,2-Dichlorobenzene	ug/l	3/28/2001	1/24/2002	8	0	0%		0.15		0.1	0.5
1,2-Dichloroethane	ug/l	3/28/2001	1/24/2002	4	0	0%		0.25		0.5	0.5
1,2-Dichloropropane	ug/l	3/28/2001	1/24/2002	4	0	0%		0.25		0.5	0.5
1,2-Diphenylhydrazine	ug/l	3/28/2001	1/23/2002	4	0	0%		0.1		0.2	0.2
1,2-Trans-dichloroethylene	ug/l	3/28/2001	1/24/2002	4	0	0%		0.3125		0.5	1
1,3-Dichlorobenzene	ug/l	3/28/2001	1/24/2002	8	0	0%		0.15		0.1	0.5
1,3-Dichloropropene	ug/l	3/28/2001	1/24/2002	4	0	0%		0.25		0.5	0.5
1,4-Dichlorobenzene	ug/l	3/28/2001	1/24/2002	8	0	0%		0.15		0.1	0.5
2,4,5-TP (Silvex)	ug/l	3/29/2001	1/24/2002	4	0	0%		0.2		0.2	1
2,4,6-Trichlorophenol	ug/l	3/28/2001	1/23/2002	4	0	0%		0.05		0.1	0.1
2,4-D	ug/l	3/29/2001	1/24/2002	4	0	0%		0.5		1	1
2,4-Dichlorophenol	ug/l	3/28/2001	1/23/2002	4	0	0%		0.05		0.1	0.1
2,4-Dimethylphenol	ug/l	3/28/2001	1/23/2002	4	0	0%		1		1	3
2,4-Dinitrophenol	ug/l	3/28/2001	1/23/2002	4	0	0%		0.25		0.5	0.5
2,4-Dinitrotoluene	ug/l	3/28/2001	1/23/2002	4	0	0%		0.05		0.1	0.1
2,6-Dinitrotoluene	ug/l	3/28/2001	1/23/2002	4	0	0%		0.05		0.1	0.1
2-Chloroethyl vinyl ether	ug/l	3/28/2001	1/24/2002	4	0	0%		0.3125		0.5	1
2-Chloronaphthalene	ug/l	3/28/2001	1/23/2002	4	0	0%		0.05		0.1	0.1
2-Chlorophenol	ug/l	3/28/2001	1/23/2002	4	0	0%		0.1		0.2	0.2
2-Methyl-4,6-Dinitrophenol	ug/l	3/28/2001	1/23/2002	4	0	0%		0.25		0.5	0.5
2-Nitrophenol	ug/l	3/28/2001	1/23/2002	4	0	0%		0.1		0.2	0.2
3,3'-Dichlorobenzidine	ug/l	3/28/2001	1/23/2002	4	0	0%		0.1		0.2	0.2
3-Methyl-4-Chlorophenol	ug/l	3/28/2001	1/23/2002	4	1	25%	0.03	0.05	0.03	0.1	0.1
4,4'-DDD	ug/l	3/28/2001	1/23/2002	4	0	0%		0.005		0.01	0.01
4,4'-DDE	ug/l	3/28/2001	1/23/2002	4	0	0%		0.005		0.01	0.01
4,4'-DDT	ug/l	3/28/2001	1/23/2002	4	0	0%		0.01		0.02	0.02
4-Bromophenyl phenyl ether	ug/l	3/28/2001	1/23/2002	4	0	0%		0.05		0.1	0.1
4-Chlorophenyl phenyl ether	ug/l	3/28/2001	1/23/2002	4	0	0%		0.05		0.1	0.1
4-Nitrophenol	ug/l	3/28/2001	1/23/2002	4	1	25%	0.14	0.22	0.14	0.5	0.5
Acenaphthene	ug/l	3/28/2001	1/23/2002	4	0	0%		0.05		0.1	0.1
Acenaphthylene	ug/l	3/28/2001	1/23/2002	4	0	0%		0.05		0.1	0.1
Acrolein	ug/l	3/28/2001	1/24/2002	4	0	0%		6.875		5	30
Acrylonitrile	ug/l	3/28/2001	1/24/2002	4	0	0%		6.5		2	30
Alachlor	ug/l	10/24/2001	1/24/2002	3	0	0%		0.5		1	1

Appendix C

Carson Creek Water Quality Summary Statistics for the Upstream (R1) Monitoring Station

Constituent	Units	Begin Date	End Date	Number of Samples	Number Detected Above Reporting Limit	Percent Detected	Minimum Concentration[a]	Average Concentration[b]	Maximum Concentration[a]	Minimum Reporting Limit	Maximum Reporting Limit
Aldrin	ug/l	3/28/2001	1/23/2002	4	1	25%	0.04	0.01	0.04	0.005	0.01
alpha-BHC	ug/l	3/28/2001	1/23/2002	4	0	0%		0.005		0.01	0.01
alpha-Endosulfan	ug/l	3/28/2001	1/23/2002	4	0	0%		0.005		0.01	0.01
Aluminum (Dissolved)	ug/l	3/27/2001	2/13/2002	11	8	73%	1.6	15.8	73.8	0.2	3.1
Aluminum (Total)	ug/l	3/27/2001	2/13/2002	11	10	91%	1.4	397	2110	0.2	3.1
Ammonia	mg/l	7/19/2001	2/14/2002	8	0	0%		0.5		1	1
Anthracene	ug/l	3/28/2001	1/23/2002	4	0	0%		0.05		0.1	0.1
Antimony (Dissolved)	ug/l	3/27/2001	10/22/2001	4	4	100%	0.018	0.032	0.046	0.001	0.016
Antimony (Total)	ug/l	3/27/2001	10/22/2001	4	4	100%	0.021	0.031	0.043	0.001	0.016
Aroclor 1016	ug/l	3/28/2001	1/23/2002	4	0	0%		0.1		0.2	0.2
Aroclor 1221	ug/l	3/28/2001	1/23/2002	4	0	0%		0.1		0.2	0.2
Aroclor 1232	ug/l	3/28/2001	1/23/2002	4	0	0%		0.1		0.2	0.2
Aroclor 1242	ug/l	3/28/2001	1/23/2002	4	0	0%		0.1		0.2	0.2
Aroclor 1248	ug/l	3/28/2001	1/23/2002	4	1	25%	1.03	0.33	1.03	0.2	0.2
Aroclor 1254	ug/l	3/28/2001	1/23/2002	4	0	0%		0.1		0.2	0.2
Aroclor 1260	ug/l	3/28/2001	1/23/2002	4	0	0%		0.1		0.2	0.2
Arsenic (Dissolved)	ug/l	3/27/2001	10/22/2001	4	3	75%	0.143	0.28	0.41	0.028	0.63
Arsenic (Total)	ug/l	3/27/2001	10/22/2001	4	4	100%	0.173	0.34	0.63	0.028	0.63
Asbestos	mf/l	3/28/2001	1/28/2002	4	0	0%		0.2375		0.2	1.13
Atrazine	ug/l	3/29/2001	1/24/2002	4	0	0%		0.5		1	1
Barium (Dissolved)	ug/l	3/27/2001	10/22/2001	4	4	100%	7.62	10.3	13.8	0.017	0.19
Barium (Total)	ug/l	3/27/2001	10/22/2001	4	4	100%	11.7	12.5	14.4	0.017	0.19
Bentazon	ug/l	3/29/2001	1/24/2002	4	0	0%		0.2875		0.1	2
Benzene	ug/l	3/28/2001	1/24/2002	4	0	0%		0.175		0.3	0.5
Benzidine	ug/l	3/28/2001	1/23/2002	4	0	0%		0.5		1	1
Benzo (a) anthracene	ug/l	3/28/2001	1/23/2002	4	0	0%		0.05		0.1	0.1
Benzo (a) pyrene	ug/l	3/28/2001	1/23/2002	4	0	0%		0.1		0.2	0.2
Benzo (b) fluoranthene	ug/l	3/28/2001	1/23/2002	4	0	0%		0.05		0.1	0.1
Benzo (g,h,i) perylene	ug/l	3/28/2001	1/23/2002	4	0	0%		0.1		0.2	0.2
Benzo (k) fluoranthene	ug/l	3/28/2001	1/23/2002	4	0	0%		0.05		0.1	0.1
Beryllium (Dissolved)	ug/l	3/27/2001	10/22/2001	4	0	0%		0.02175		0.005	0.083
Beryllium (Total)	ug/l	3/27/2001	10/22/2001	4	1	25%	0.018	0.026	0.018	0.005	0.083
beta-BHC	ug/l	3/28/2001	1/23/2002	4	0	0%		0.00375		0.005	0.01
beta-Endosulfan	ug/l	3/28/2001	1/23/2002	4	0	0%		0.005		0.01	0.01
Bis (2-chloroethoxy) methane	ug/l	3/28/2001	1/23/2002	4	0	0%		0.5		1	1
Bis (2-chloroethyl) ether	ug/l	3/28/2001	1/23/2002	4	0	0%		0.5		1	1
Bis (2-chloroisopropyl) ether	ug/l	3/28/2001	1/23/2002	4	0	0%		0.1		0.2	0.2
Bis (2-ethylhexyl) phthalate	ug/l	3/28/2001	1/23/2002	4	0	0%		1		2	2
Bromodichloromethane	ug/l	3/28/2001	1/24/2002	4	0	0%		0.25		0.5	0.5
Bromoform	ug/l	3/28/2001	1/24/2002	4	0	0%		0.25		0.5	0.5
Butyl benzyl phthalate	ug/l	3/28/2001	1/23/2002	4	0	0%		0.05		0.1	0.1

Appendix C

Carson Creek Water Quality Summary Statistics for the Upstream (R1) Monitoring Station

Constituent	Units	Begin Date	End Date	Number of Samples	Number Detected Above Reporting Limit	Percent Detected	Minimum Concentration[a]	Average Concentration[b]	Maximum Concentration[a]	Minimum Reporting Limit	Maximum Reporting Limit
Cadmium (Dissolved)	ug/l	3/27/2001	10/22/2001	4	1	25%	0.006	0.010	0.006	0.002	0.036
Cadmium (Total)	ug/l	3/27/2001	10/22/2001	4	1	25%	0.014	0.012	0.014	0.002	0.036
Carbofuran	ug/l	3/29/2001	1/24/2002	4	0	0%		1.3		0.2	5
Carbon Tetrachloride	ug/l	3/28/2001	1/24/2002	4	0	0%		0.25		0.5	0.5
Chlordane	ug/l	3/28/2001	1/23/2002	4	0	0%		0.005		0.01	0.01
Chloride	mg/l	3/29/2001	1/24/2002	4	4	100%	15	29	50	5	5
Chlorobenzene	ug/l	3/28/2001	1/24/2002	4	0	0%		0.4375		0.5	2
Chloroethane	ug/l	3/28/2001	1/24/2002	4	0	0%		0.4375		0.5	2
Chloroform	ug/l	3/28/2001	1/24/2002	4	0	0%		0.25		0.5	0.5
Chlorpyrifos	ug/l	3/29/2001	1/24/2002	5	0	0%		0.215		0.05	1
Chromium (Dissolved)	ug/l	3/27/2001	10/22/2001	4	0	0%		0.115		0.03	0.55
Chromium (Total)	ug/l	3/27/2001	10/22/2001	4	2	50%	2.33	1.29	2.68	0.03	0.55
Chrysene	ug/l	3/28/2001	1/23/2002	4	0	0%		0.05		0.1	0.1
cis-1,2-Dichloroethene	ug/l	3/28/2001	1/24/2002	4	0	0%		0.25		0.5	0.5
Copper (Dissolved)	ug/l	3/27/2001	2/13/2002	11	11	100%	0.85	2.15	3.56	0.01	0.2
Copper (Total)	ug/l	3/27/2001	2/13/2002	11	11	100%	0.95	4.82	15.5	0.01	0.2
Cyanide	ug/l	3/29/2001	1/24/2002	4	0	0%		2.5		5	5
Dalapon	ug/l	3/29/2001	1/24/2002	4	0	0%		1		2	2
delta-BHC	ug/l	3/28/2001	1/23/2002	4	0	0%		0.00375		0.005	0.01
Di(2-ethylhexyl)adipate	ug/l	3/29/2001	1/24/2002	4	0	0%		2.5		5	5
Diazinon	ug/l	3/29/2001	1/24/2002	5	0	0%		0.085		0.05	0.25
Dibenzo (a,h) anthracene	ug/l	3/28/2001	1/23/2002	4	0	0%		0.1		0.2	0.2
Dibromochloromethane	ug/l	3/28/2001	1/24/2002	4	0	0%		0.25		0.5	0.5
Dibromochloropropane	ug/l	3/28/2001	1/24/2002	4	0	0%		3.75125		0.01	10
Dieldrin	ug/l	3/28/2001	1/23/2002	4	0	0%		0.005		0.01	0.01
Diethyl phthalate	ug/l	3/28/2001	1/23/2002	4	0	0%		0.15		0.3	0.3
Dimethyl phthalate	ug/l	3/28/2001	1/23/2002	4	1	25%	0.03	0.05	0.03	0.1	0.1
Di-n-butyl phthalate	ug/l	3/28/2001	1/23/2002	4	1	25%	0.93	0.38	0.93	0.4	0.4
Di-n-octyl phthalate	ug/l	3/28/2001	1/23/2002	4	0	0%		0.1		0.2	0.2
Dinoseb	ug/l	3/29/2001	1/24/2002	4	0	0%		0.5		1	1
Diquat	ug/l	3/29/2001	1/24/2002	4	0	0%		2		4	4
Dissolved Oxygen	mg/l	1/2/2001	12/27/2006	154	154	100%	5.6	10	21		
Endosulfan sulfate	ug/l	3/28/2001	1/23/2002	4	0	0%		0.005		0.01	0.01
Endothall	ug/l	3/29/2001	1/24/2002	4	0	0%		22.5		45	45
Endrin	ug/l	3/28/2001	1/23/2002	4	0	0%		0.005		0.01	0.01
Endrin Aldehyde	ug/l	3/28/2001	1/23/2002	4	0	0%		0.005		0.01	0.01
Ethylbenzene	ug/l	3/28/2001	1/24/2002	4	0	0%		0.3625		0.3	2
Ethylene dibromide	ug/l	3/28/2001	1/24/2002	4	0	0%		1.8775		0.02	5
Flow	MGD	1/2/2001	12/27/2006	155	155	100%	0.01	10.14658065	100		
Fluoranthene	ug/l	3/28/2001	1/23/2002	4	0	0%		0.05		0.1	0.1
Fluorene	ug/l	3/28/2001	1/23/2002	4	0	0%		0.050		0.1	0.1

Appendix C
Carson Creek Water Quality Summary Statistics for the Upstream (R1) Monitoring Station

Constituent	Units	Begin Date	End Date	Number of Samples	Number Detected Above Reporting Limit	Percent Detected	Minimum Concentration[a]	Average Concentration[b]	Maximum Concentration[a]	Minimum Reporting Limit	Maximum Reporting Limit
Fluoride	mg/l	3/29/2001	1/24/2002	4	4	100%	0.05	0.06375	0.091	0.1	0.1
gamma BHC	ug/l	3/28/2001	1/23/2002	4	0	0%		0.005		0.01	0.01
Glyphosate	ug/l	3/29/2001	1/24/2002	4	0	0%		13		25	25
Hardness (as CaCO3)	mg/l	3/28/2001	2/14/2002	11	11	100%	67	140.6363636	180	1	1
Heptachlor	ug/l	3/28/2001	1/23/2002	4	0	0%		0.005		0.01	0.01
Heptachlor epoxide	ug/l	3/28/2001	1/23/2002	4	1	25%	0.0015	0.003	0.0015	0.001	0.01
Hexachlorobenzene	ug/l	3/28/2001	1/23/2002	4	0	0%		0.05		0.1	0.1
Hexachlorobutadiene	ug/l	3/28/2001	1/24/2002	5	0	0%		0.18		0.2	1
Hexachlorocyclopentadiene	ug/l	3/28/2001	1/23/2002	4	0	0%		0.1		0.2	0.2
Hexachloroethane	ug/l	3/28/2001	1/23/2002	4	0	0%		0.1		0.2	0.2
Indeno (1,2,3-c,d) pyrene	ug/l	3/28/2001	1/23/2002	4	0	0%		0		0.2	0.2
Iron (Dissolved)	ug/l	3/27/2001	10/22/2001	4	4	100%	47.4	101	232	1.9	5.3
Iron (Total)	ug/l	3/27/2001	10/22/2001	4	4	100%	147	1189.55	4250	1.9	5.3
Isophorone	ug/l	3/28/2001	1/23/2002	4	0	0%		0.250		0.5	0.5
Lead (Dissolved)	ug/l	3/27/2001	10/22/2001	4	1	25%	0.009	0.018	0.009	0.004	0.068
Lead (Total)	ug/l	3/27/2001	10/22/2001	4	2	50%	0.259	0.1	0.273	0.004	0.068
Manganese (Dissolved)	ug/l	3/27/2001	10/22/2001	4	4	100%	15.8	31.3	63.6	0.01	1.04
Manganese (Total)	ug/l	3/27/2001	10/22/2001	4	4	100%	41.1	66.281575	88.2	0.01	1.04
MBAS	mg/l	3/28/2001	1/24/2002	4	0	0%		0.10000		0.1	0.5
Mercury (Dissolved)	ug/l	3/27/2001	4/17/2002	5	5	100%	0.001	0.00192	0.00361	0.0002	0.00025
Mercury (Total)	ug/l	3/27/2001	4/17/2002	5	5	100%	0.00135	0.003482	0.00816	0.0002	0.00025
Methoxychlor	ug/l	3/28/2001	1/23/2002	4	0	0%		0.025		0.05	0.05
Methyl bromide	ug/l	3/28/2001	1/24/2002	4	0	0%		0.4375		0.5	2
Methyl chloride	ug/l	3/28/2001	1/24/2002	4	0	0%		0.25		0.5	0.5
Methylene chloride	ug/l	3/28/2001	1/24/2002	4	0	0%		0.4375		0.5	2
Methyl-tert-butyl ether (MTBE)	ug/l	3/28/2001	1/24/2002	4	0	0%		2.25		3	5
Molinate	ug/l	3/29/2001	1/24/2002	5	0	0%		1		2	2
Naphthalene	ug/l	3/28/2001	1/24/2002	5	0	0%		1.04		0.1	10
Nickel (Dissolved)	ug/l	3/27/2001	10/22/2001	4	4	100%	0.92	1.06	1.28	0.01	0.11
Nickel (Total)	ug/l	3/27/2001	10/22/2001	4	4	100%	1.11	2.02815	2.72	0.01	0.11
Nitrate (as N)	mg/l	3/29/2001	1/24/2002	4	4	100%	0.1	0.45	1.5	0.5	0.5
Nitrite (as N)	mg/l	3/29/2001	1/24/2002	4	0	0%		0.07		0.12	0.15
Nitrobenzene	ug/l	3/28/2001	1/23/2002	4	1	25%	0.22	0.2425	0.22	0.5	0.5
N-Nitrosodimethylamine	ug/l	3/28/2001	1/23/2002	4	0	0%		0.5		1	1
N-Nitroso-di-n-propylamine	ug/l	3/28/2001	1/23/2002	4	0	0%		0.5		1	1
N-Nitrosodiphenylamine	ug/l	3/28/2001	1/23/2002	4	0	0%		0.1		0.2	0.2
Oxamyl	ug/l	3/29/2001	1/24/2002	4	0	0%		5.025		0.1	20
Pentachlorophenol	ug/l	3/28/2001	1/24/2002	5	0	0%		0.3		0.5	1
pH	std units	1/2/2001	12/27/2006	160	160	100%	6.5	7.4586375	8.2		
Phenanthrene	ug/l	3/28/2001	1/23/2002	4	0	0%		0.05		0.1	0.1
Phenol	ug/l	3/28/2001	1/23/2002	4	0	0%		0.15		0.3	0.3

Appendix C

Carson Creek Water Quality Summary Statistics for the Upstream (R1) Monitoring Station

Constituent	Units	Begin Date	End Date	Number of Samples	Number Detected Above Reporting Limit	Percent Detected	Minimum Concentration[a]	Average Concentration[b]	Maximum Concentration[a]	Minimum Reporting Limit	Maximum Reporting Limit
Phosphorus (Total)	mg/l	3/28/2001	1/24/2002	4	1	25%	0.14	0.05375	0.14	0.05	0.05
Picloram	ug/l	3/29/2001	1/24/2002	4	0	0%		0.5		1	1
Pyrene	ug/l	3/28/2001	1/23/2002	4	0	0%		0.05		0.1	0.1
Selenium (Dissolved)	ug/l	3/27/2001	10/22/2001	4	2	50%	0.32	0.52	0.92	0.043	1.67
Selenium (Total)	ug/l	3/27/2001	10/22/2001	4	1	25%	0.25	0.387075	0.25	0.043	1.67
Silver (Dissolved)	ug/l	3/27/2001	10/22/2001	4	0	0%		0.019		0.004	0.105
Silver (Total)	ug/l	3/27/2001	10/22/2001	4	1	25%	0.016	0.022575	0.016	0.004	0.105
Simazine	ug/l	3/29/2001	1/24/2002	5	0	0%		1		1	4
Specific conductance	umhos/cm	1/2/2001	12/27/2006	197	197	100%	120	382	760	0.91	1
Styrene	ug/l	3/28/2001	1/24/2002	4	0	0%		1.9375		0.5	5
Sulfate (as SO4)	mg/l	3/29/2001	1/24/2002	4	4	100%	17	22	26	0.5	0.5
Sulfide	mg/l	3/28/2001	1/24/2002	4	0	0%		0.5		1	1
Sulfite	mg/l	3/28/2001	2/14/2002	9	1	11%	0.25	1	0.25	2	5
TDS (Total dissolved solids)	mg/l	3/28/2001	2/14/2002	11	11	100%	140	228.2	400	1	10
Temperature	F	1/3/2001	12/27/2006	157	157	100%	40.46	53.97961783	74.3		
Tetrachloroethylene	ug/l	3/28/2001	1/24/2002	4	0	0%		0.250		0.5	0.5
Thallium (Dissolved)	ug/l	3/27/2001	10/22/2001	4	2	50%	0.001	0.004	0.013	0.001	0.01
Thallium (Total)	ug/l	3/27/2001	10/22/2001	4	2	50%	0.004	0.003725	0.007	0.001	0.01
Thiobencarb	ug/l	3/29/2001	1/24/2002	5	0	0%		0.5		1	1
Toluene	ug/l	3/28/2001	1/24/2002	4	0	0%		0.3625		0.3	2
Toxaphene	ug/l	3/28/2001	1/23/2002	4	0	0%		0.1		0.2	0.2
Tributyltin	ug/l	3/28/2001	1/23/2002	5	1	20%	0.003	0.0015	0.003	0.002	0.003
Trichloroethylene	ug/l	3/28/2001	1/24/2002	4	0	0%		0.4375		0.5	2
Trichlorofluoromethane	ug/l	3/28/2001	1/24/2002	4	0	0%		0.8		0.5	5
Turbidity	NTU	1/2/2001	12/27/2006	187	187	100%	0.42	8.371716578	160		
Vinyl Chloride	ug/l	3/28/2001	1/24/2002	4	0	0%		0.25		0.5	0.5
Xylenes	ug/l	3/28/2001	1/24/2002	4	0	0%		0.25		0.5	0.5
Zinc (Dissolved)	ug/l	3/27/2001	10/22/2001	4	4	100%	0.22	1.3	2.78	0.03	0.47
Zinc (Total)	ug/l	3/27/2001	10/22/2001	4	3	75%	0.47	8.1	16.9	0.03	0.47

Notes:

[a] Concentrations reported include estimated concentrations between the method detection limit and laboratory reporting limit; hence concentrations may be lower than the reporting limit range specified.

[b] One-half of the reporting limit for "non-detect" samples is used to calculate the average. Hence the average could fall outside of the range of minimum and maximum concentrations reported.

Appendix D

Incremental Water Quality Changes for Infrequently Detected Long-term Constituents

Incremental change in Carson Creek water quality due to future discharges of infrequently detected constituents and comparison to applicable long-term water quality standards.

Constituent	Units	Effluent Detection Frequency	Concentration in Carson Creek downstream of EDHWWTP Outfall			Lowest Applicable Water Quality Criteria		Assimilative Capacity	
			Current (3.0 mgd) Discharge Rate	Future (4.0 mgd) Discharge Rate	Incremental Increase	Value	Basis	Available	Used by Expansion
Trace Metals									
Beryllium (Dissolved)	ug/l	6%	0.145	0.151	0.006	4	DHS MCL	3.86	0%
Beryllium (Total)	ug/l	13%	0.214	0.221	0.007	4	DHS MCL	3.79	0%
Organics									
1,3-Dichlorobenzene	ug/l	4%	0.451	0.468	0.017	400	CTR-HH	400	na
1,4-Dichlorobenzene	ug/l	11%	0.450	0.466	0.016	5	DHS MCL	4.55	na
2,4-Dichlorophenol	ug/l	13%	0.613	0.635	0.022	93	CTR-HH	92.4	na
2-Chlorophenol	ug/l	7%	0.592	0.614	0.022	120	CTR-HH	119	na
2-Nitrophenol	ug/l	7%	2.880	2.99	0.107	na	--	--	--
3-Methyl-4-Chlorophenol	ug/l	7%	1.45	1.50	0.052	na	--	--	--
4,4’-DDT	ug/l	7%	0.008	0.008	0.000	0	Basin Plan	0	na
4-Nitrophenol	ug/l	7%	2.96	3.06	0.101	na	--	--	--
Aldrin	ug/l	7%	0.005	0.005	0.000	0	Basin Plan	0	na
alpha-BHC	ug/l	13%	0.005	0.005	0.000	0	Basin Plan	0	na
beta-BHC	ug/l	7%	0.003	0.003	0.000	0	Basin Plan	0	na
beta-Endosulfan	ug/l	13%	0.008	0.008	0.000	0	Basin Plan	0	na
Bis (2-chloroethyl) ether	ug/l	7%	0.554	0.575	0.021	0.031	CTR-HH	0	na
Chlordane	ug/l	7%	0.033	0.034	0.001	0	Basin Plan	0	na
Chloroethane	ug/l	9%	0.579	0.600	0.021	na	--	--	--
Dalapon	ug/l	8%	6.53	6.77	0.241	200	DHS MCL	193	0%
delta-BHC	ug/l	7%	0.002	0.003	0.001	0	Basin Plan	0	na
Diethyl phthalate	ug/l	13%	0.629	0.652	0.023	23,000	CTR-HH	23,000	0%
Dimethyl phthalate	ug/l	13%	0.591	0.611	0.020	313,000	CTR-HH	313,000	0%
Di-n-butyl phthalate	ug/l	7%	2.99	3.085	0.097	2700	CTR-HH	2700	0%
Endrin	ug/l	7%	0.005	0.005	0.000	0	Basin Plan	0	na
Ethylbenzene	ug/l	13%	0.569	0.590	0.021	300	DHS MCL	299	0%
Heptachlor	ug/l	13%	0.008	0.009	0.001	0	Basin Plan	0	na

Incremental change in Carson Creek water quality due to future discharges of infrequently detected constituents and comparison to applicable long-term water quality standards.

Constituent	Units	Effluent Detection Frequency	Concentration in Carson Creek downstream of EDHWWTP Outfall			Lowest Applicable Water Quality Criteria		Assimilative Capacity	
			Current (3.0 mgd) Discharge Rate	Future (4.0 mgd) Discharge Rate	Incremental Increase	Value	Basis	Available	Used by Expansion
Isophorone	ug/l	7%	0.335	0.348	0.013	8.4	CTR-HH	8.07	0%
Methyl bromide	ug/l	13%	0.710	0.736	0.026	48	CTR-HH	47.3	0%
Methylene chloride	ug/l	13%	0.570	0.591	0.021	4.7	CTR-HH	4.13	1%
Methyl-tert-butyl ether (MTBE)	ug/l	5%	1.71	1.778	0.064	5	DHS 2nd MCL	3.29	2%
Nitrobenzene	ug/l	7%	2.95	3.052	0.100	17	CTR-HH	14.0	1%
Phenanthrene	ug/l	7%	0.073	0.075	0.002	na	--	--	--
Phenol	ug/l	7%	0.339	0.352	0.013	21,000	CTR-HH	21,000	0%

Notes:

Basin Plan = Water Quality Control Plan objective for the Sacramento and San Joaquin Rivers basins.

CTR-HH = California Toxics Rule criterion for the protection of human health (consumption of water and organisms).

DHS MCL = Department of Health Services maximum contaminant level.

DHS 2nd MCL= Department of Health Services secondary maximum contaminant level.

Total Rec. = total recoverable.

na = not applicable, because no assimilative capacity is available.

Appendix E

Antidegradation Alternative Cost Estimate for El Dorado Hills WWTP

April 6, 2007
7216A20

RECEIVED APR 10 2007 BY: TS

Robertson-Bryan, Inc.
9888 Kent Street
Elk Grove, CA 95624

Attention: Andrew Sayers-Fay, Ph.D.

Subject: Antidegradation Alternatives Cost Estimate for El Dorado Hills WWTP (EDHWWTP)

Dear Mr. Andrew Sayers-Fay:

An Antidegradation Analysis is being prepared by Robertson-Bryan, Inc (RBI) to assess the nature and degree to which increased discharges would result in a lowering of Carson Creek water quality, whether resultant conditions would be protective of the creek's beneficial uses, and whether allowing the potential incremental degradation from constituents would be consistent with maximum benefit to the people of the State. Carollo Engineers has been asked to provide a cost estimate for the treatment and control alternatives recommended by RBI. Through discussions with RBI it is Carollo Engineers' understanding that our cost estimates are based off of the assumption that the design flow is 4 million gallons per day (mgd), which is an increase of 1 mgd of the current capacity. The construction costs for the following treatment and controls that were evaluated include:

1. Higher level of treatment of the wastewater using microfiltration.
2. Zero Discharge (100% recycling) of the additional plant capacity, which would require additional storage capacity.
3. Intermittent Discharge to Carson Creek when creek flow-to-effluent discharge ratio is sufficient to prevent any constituent from causing a 10% or greater utilization of assimilative capacity.
4. Pollutant source minimization by changing existing treatment and controls to other means that will minimize impact.
5. Connect to Sacramento Regional Wastewater Treatment Plant eliminating discharge to Carson Creek altogether.

The first alternative of changing the treatment process at the EDHWWTP to an advance treatment technology like microfiltration was evaluated. Cost curves developed from previous Carollo Engineers' jobs for advance treatment technologies along with escalation of a similar project being constructed for the Carmel Area Wastewater District in California were used for estimation purposes. Based on the cost curves and recent Carmel project, a 4 mgd microfiltration plant is estimated to have a construction estimate of $37 million. Engineering and Administration fees were assumed to be 20% of the total construction cost for a total of $7.4 million for a project cost of $44.4 million. Annual Operation and Maintenance (O&M) cost for the microfiltration plant is estimated to be $2.26 million.

Zero discharge through 100% recycling of the additional flow of 1 mgd was assessed. Carollo Engineers assumed that the storage reservoir would have to be constructed outside of the limited space of EDHWWTP, a distance of 5 miles was assumed for piping. To provide 6 months of storage, a reservoir/pond with a minimum capacity of 181 million gallons would need to be constructed. A reservoir/pond with a depth of 10 feet would require a minimum footprint of 65 acres. A reservoir/pond of this size would require a dam permit. The pond construction cost is estimated to be $31 million, which includes a pond liner and a return pump station and piping but does not include any land acquisition or right of way for a pipeline. Engineering and Administration fees were assumed to be 20% of the total construction cost for a total of $6.2 million for a project cost of $37.2 million. Annual Operation and Maintenance (O&M) cost for the reservoir and pump station is estimated to be $ 930,000.

Discussions with RBI about intermittent discharge to Carson Creek of the additional plant capacity concluded that the dilution ratio required to minimize the impact of constituents on the creek would only allow discharge to take place less than 4% of the time out of the year. Similarly to option 2, a storage reservoir would need to be constructed. This option was determined to be unfeasible due to the restricted discharge requirements and the resulting storage capacity that would be required.

Pollutant source minimization using different treatment and controls was evaluated, the ultraviolet disinfection is currently provided in the current expansion design. Ultraviolet disinfection technology is designed in the proposed expansion as a means to minimize pollutant sources that occur from disinfection chemicals like chlorine. Chlorine disinfection results in disinfection byproducts (DBPs) like trihalomethanes (THMs). Additional treatment and control options evaluated to minimize pollutants sources included the discontinued use of alum as a coagulant and providing better pH control for drinking water. If coagulation were removed then microfiltration would need to be required to remove the settleable solids from the water. The construction cost estimate for the conversion to microfiltration from coagulation would be $36 million at the water treatment plant. Engineering and Administration fees were assumed to be 20% of the total construction cost for a total of $7.2 million. Annual Operation and Maintenance (O&M) cost for the microfiltration plant is estimated to be $2.2 million for a project cost at the water treatment plant of $43.2 million. A microfiltration plant will also be required to remove algae from the equalization pond water at EDHWWTP, with an estimated construction cost of $37 million. Engineering and Administration fees O&M cost for the microfiltration plant is estimated to be $7.4 and $2.26 million respectively. The microfiltration plant at EDHWWTP would have a project cost of $44.4 million. Better pH control to limit copper corrosion within pipes can be achieved by switching coagulants to polyaluminum chloride (PAC), which is a less temperamental coagulant. The downside to PAC is that it is at least 3 times as expensive as alum and process upset can occur when transitioning coagulants. Conversion to PAC has an estimated construction cost of $5 million. Engineering and Administration fees were assumed to be 20% of the total construction cost for a total of $1 million, for a project cost of $6 million. Annual Operation and Maintenance (O&M) cost for the new chemical feed system is estimated to be $305,000.

Connecting El Dorado Hills to SRWTP was evaluated as a potential alternative. This would eliminate the need for the EDHWWTP. It was assumed that a 20-mile 30" gravity pipeline would need to be installed. Cost for highway and railroad crossings and connection fees were taken into consideration. For purposes of estimating the connection fee, it was assumed flow at EDHWWTP is presently residential, commercial and industrial and the connections are 80% residential and 20% commercial/industrial. Under these assumptions the connection fees and construction cost was estimated at $104 million. This estimate does not include potential right of way costs. Engineering and Administration fees were assumed to be 20% of the total construction cost for a total of $20.8 million, for a project cost of $125 million. Annual Operation and Maintenance (O&M) cost for the pipeline is estimated to be $3.2 million.

If you have any questions please call me at (916) 565-4888.

Sincerely,

CAROLLO ENGINEERS, P.C.

Keith Corcoran

Keith Corcoran
Engineer

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KTC:VS